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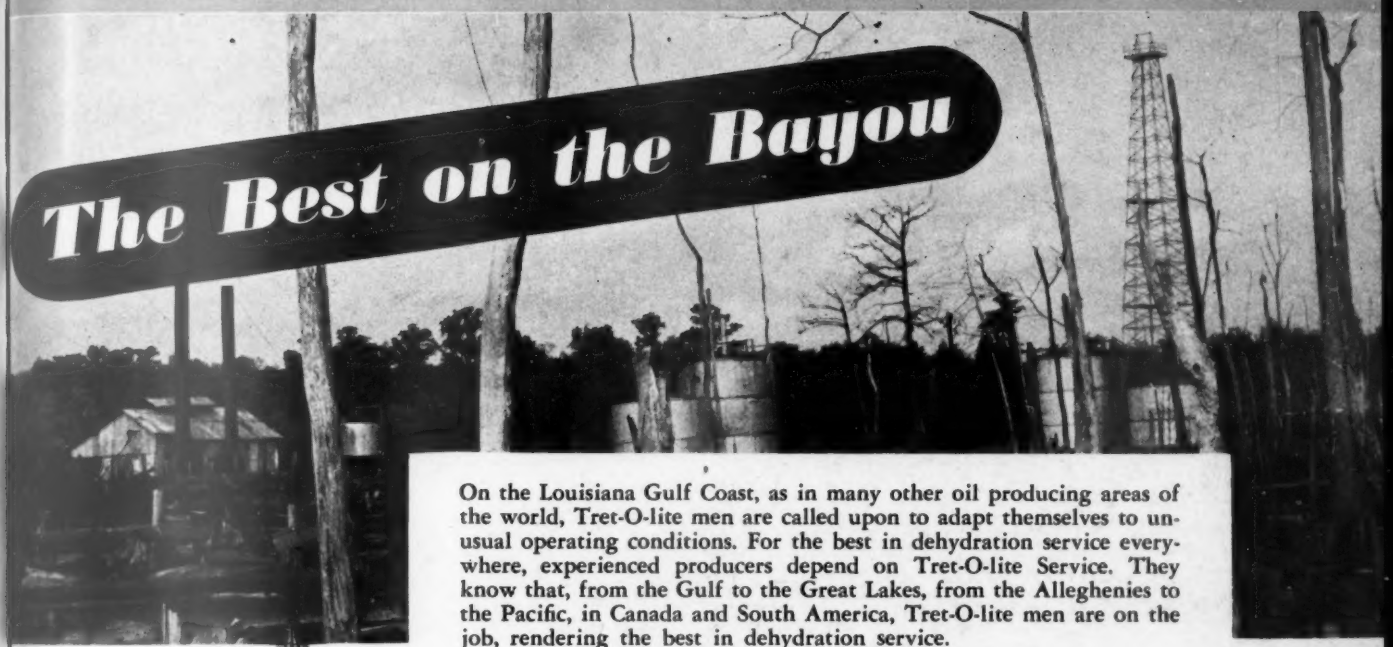

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published weekly by the

PETROLEUM PUBLISHING COMPANY

211 S. CHEYENNE ST., TULSA, OKLAHOMA

Subscription price, United States and foreign, 1 year, $6.00; 2 years, $10.00; 3 years, $12.00; 5 years, $15.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879.

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Vol. 42, No. 31 December 9, 1943

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Table of Contents

NEWS DEVELOPMENTS

Railroads Move 45,000 Bbl. Daily to California ... 26
DSC Approves Reimbursements ... 26
Regular Postwar Gasoline Expected to Be 80 Octane ... 27
Diplomatic Support Preferable to Government Ownership ... 28
PRC Purchase Program Fading ... 28
Ickes Confirms Policy on Foreign-Petroleum Ownership ... 30
More Data Presented Supporting Higher Ceiling Price for Oil 30
Texas Co. Checking Lewis and Selby Properties ... 31
Gas Turbine Practical, A.S.M.E. Told ... 32
Future for Diesel Engines ... 34
Petroleum Electric Power Association Discusses Problems ... 39
Mexico's Production Continues Upward ... 41
Deaths ... 41
Importance of 100-Octane Disclosed by Administrator ... 107

Trends ... 25
This Week ... 29
Editorial ... 33
Refining News ... 81
Pipe-Line News ... 84
Natural-Gas News ... 87

ENGINEERING-OPERATING

Reducing Rotary Drilling Hazards in Rocky Mountains ... 43
Magnaflux Method Detects Defects in Steel ... 49
Oil-Well Pumping Practices—No. 21 ... 50
Bareco Runs Codimer Unit by Remote Control ... 56
Making Tube Headers ... 57
Cracking Technology—No. 10 ... 64
Wartime Fuel Research in Great Britain ... 69
Abstracts of A.S.M.E. Papers ... 70

Plant Practices ... 54
Front Lines in Refining ... 61
Questions on Technology ... 62
Cost Engineering ... 73
Journalog ... 75
Eng. Fundamentals ... 77

EXPLORATION AND DRILLING

Week's Highlights ... 89
Completions in All Fields ... 89
Daily Average Production for Week ... 90
Reports by Areas Start on Page ... 90
Weekly Wildcat Completions and Discoveries ... 106

ADDITIONAL FEATURES

Drilling Contractors ... 108
Personals ... 110
Market Developments ... 112
Refinery Prices ... 113
Tank-Wagon Prices ... 113
Equipment Progress ... 114
Classified Advertising ... 115
Calendar of Events ... 120
Journalisms ... 120
Advertisers' Index ... 120

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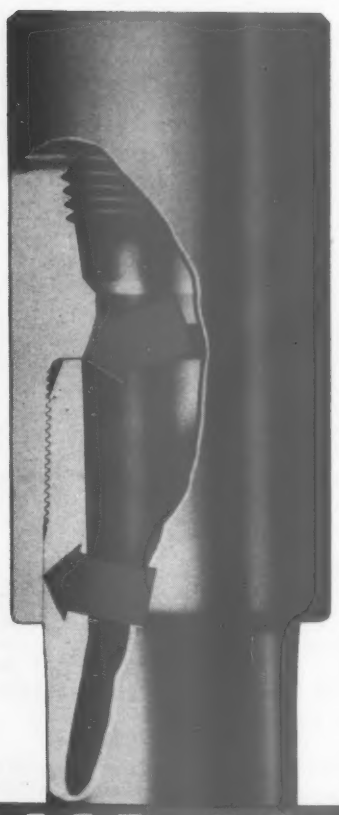

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Trends

Crude-Oil Production
By States — Page 90

CRUDE-OIL STOCKS 239,761,000 bbl. as of Nov. 27—down 108,000 bbl. One year ago 234,850,000 bbl.

GASOLINE STOCKS 69,980,000 bbl. as of Nov. 27—up 984,000 bbl. One year ago 74,628,000 bbl.

RESIDUAL FUEL-OIL STOCKS 62,143,000 bbl. as of Nov. 27—down 519,000. One year ago 78,674,000.

GAS OIL AND DISTILLATE 46,187,000 as of Nov. 27—up 415,000 bbl. One year ago 50,195,000.

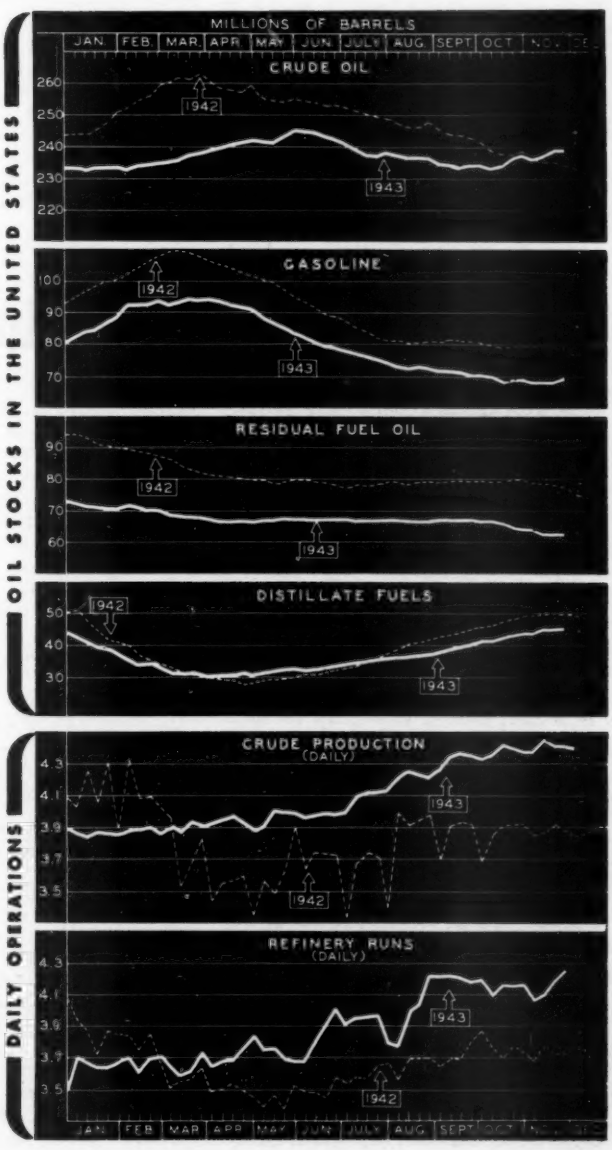
CRUDE-OIL PRODUCTION 4,395,255 bbl. daily average—down 7,710 bbl. One year ago 3,841,845.

REFINERY RUNS 4,261,000 bbl. daily week ended Nov. 27—up 69,000 bbl. One year ago 3,740,000.

ANALYSIS of the reimbursement plan under which District 2 refiners are expected to draw up to 42,000 bbl. of sour crude daily from West Texas left plant operators this week deeply concerned over the cost factor which, assuming the most economic aspects possible, leaves a discouraging competitive differential of 35 to 40 cents. After next April when the Stanolind Pipe Line Co.'s 16-in. system is completed to Drumright, Okla., the Defense Supplies Corp. reimbursement plan will become much more attractive and will more nearly equalize costs. In the interim, however, the complete haul by rail from West Texas to refineries in District 2 contains many obstacles.

WHERE refineries are not located on pipe lines, the railroad freight which the refiner would have to pay to transport the oil from the pipe-line terminal to his plant will be added to the pipe-line tariffs in computing the differential for which the refiners will be reimbursed. This qualification, it was pointed out this week by refiners examining the general announcement, fails to meet the issue squarely. For example, one plant operator asserted, the DSC plan would provide average reimbursement of 13 cents a barrel. The calculation is based on pipe-line tariff of 35 to 38 cents a barrel from West Texas to representative District 2 refinery terminals. The 13-cent average represents the difference between costs of pipe-line transportation to the nearest terminal and the tank-car freight rates from that point to the refinery. Actually. the freight rate, based on tank-car movement over the entire distance from Midland to District 2 refineries averages around 91 cents a barrel. Consequently, 36-gravity West Texas crude oil posted at $1.04 in the field would cost more than $2 a barrel delivered at District 2 refineries via railroad tank cars. The same gravity sweet crude is posted at $1.17 in the Mid-Continent, meaning that refiners' costs at the plant do not normally exceed $1.50 a barrel, covering crude price, gathering and pipe-line transportation charges to the plant.

FURTHERMORE, companies whose taxable income places them in the excess profits bracket will not be eligible to receive reimbursement of excess transportation expense. Representative plant operators were unable to state categorically just how the qualification will affect them. A preliminary check indicated, however, that so-called independent refiners will have more difficulty qualifying for reimbursement payments than will majors.



Railroads Move 45,000 Bbl. Daily From Texas Refineries to Pacific Coast

by L. P. Stockman

LOS ANGELES, Calif.—In order to meet the rapidly expanding call for petroleum products for military, lease-lend and domestic consumption, Pacific Coast operators are moving approximately 45,000 bbl. per day of special petroleum products from Texas to California by rail.

One unconfirmed report was that tank-car movement from District 3 to the Pacific Coast will be increased to 80,000 bbl. daily as rapidly as additional equipment can be made available. Some speculation was heard that the planned increase of 35,000 bbl. in daily overland movement will consist in part of crude oil. No gasoline or crude oil is included in current rail shipments to the West Coast.

Approximately 5,000 tank cars are assigned to the interdistrict movement with loadings in Texas averaging about 200 cars a day. The Petroleum Administration for War at Washington, D. C., did not give loading points. It was understood, however, that current shipments are originating chiefly in West Texas. Other supply sources will be tapped as more cars become available.

Diesel Fuel Included

Included in the 45,000-bbl. current movement is an unknown amount of 50-cetane-diesel fuel for the Navy. California refiners are unable to meet full requirements for this special fuel.

The movement of fuel oil into California from District 3 will not entirely solve the West Coast problem but will, however, alleviate conditions. Last month, California refiners reduced stocks approximately 140,000 bbl. daily, of which 96,500 bbl. was fuel oil and 36,000 bbl. was gasoline. Demand approximated 975,000 bbl. per day, including military requirements, lease-lend and domestic consumption.

A substantial reduction in civilian gasoline rations is anticipated in the near future. A total of 135,000 bbl. of gasoline per day has been earmarked for civilian consumption in December but a reduction probably will come in January.

Although seven new oil fields have been discovered in California during the first 11 months of 1943, the amount of new production added by these fields has been negligible. Drilling operations in proved fields are at the highest rate reached since 1929 but with few exceptions the zones being developed produce a heavy grade of crude oil which will not aid gasoline supplies. Since there is little hope of securing additional net production from current drilling operations only one alternative remains and that is to increase the allowables of existing wells. The allocation subcommittee of the Conservation Committee of California Oil Producers has reached the conclusion that there must be a more liberal interpretation of the maximum-efficient-rate factor used in the allocation of production in the state.

California crude oil production has been averaging around 796,000 bbl. daily and may reach 800,000 bbl. per day early in the new year but it is not likely that production can be maintained at that rate for an extended period. Those familiar with California conditions realize the Pacific Coast cannot sustain the entire demand for refined oil in the Pacific war theater and are fearful that unless outside relief occurs, California will not be able to meet the postwar demands for petroleum. The state has been reducing crude-oil reserves at a substantial rate for the past several years and liquidation in 1943 will be the largest ever recorded. A. C. Rubel, vice president of Union Oil Co., was recently quoted as saying there would be 20,000 pumping wells in California before 1944 ends.

DSC Approves Reimbursements

WASHINGTON, D. C.—Middle West refiners whose taxable incomes are below the excess-profits bracket last week were assured of reimbursement for the difference between railroad freight and pipe-line tariffs, covering tank-car shipments of West Texas crude oil to District 2 plants.

Jesse Jones, secretary of commerce, announced December 4 that, at the request of the Petroleum Administrator for War, and with the approval of James F. Byrnes, director of war mobilization, Defense Supplies Corp., will reimburse shippers for the extra transportation cost. The offer of DSC became effective December 4 and culminated a long period of negotiation between various elements in the petroleum industry and the government agency which was created to assure maximum ultilization of raw materials and manufactured commodities.

This action, DSC spokesmen explained, is necessary to utilize available refining capacity in District 2 in order to produce the maximum amount of petroleum products. Surveys of refining facilities in PAW District 2 previously had shown that existing plants could process 42,000 bbl. a day of West Texas sour crude oil, providing the extra costs of transportation could be either recovered in higher product prices or absorbed by Government.

Total idle capacity in District 2 refineries, resulting from inadequate supplies of crude within the region and insufficient pipe-line facilities from Texas, is approximately 200,000 bbl. a day. Installation of alloy furnace tubes, exchangers and corrosion-resistant linings in towers would be necessary to equip the remaining 158,000 bbl. of idle daily capacity to operate on sour crude.

Regulations under which payments will be made to District 2 refiners will be issued in full detail within a few days, the department of commerce announced.

Shell Purchases Frankel Properties in Conroe Field

HOUSTON, Tex. — Shell Oil Co., Inc., has purchased the producing properties of Frankel Brothers, Houston, in the Conroe field of Montgomery County, Texas. The deal involved 58 wells and about 1,700 acres of leases. Current production from the wells is around 2,700 bbl. per day. Operation of the leases was taken over by Shell on December 1. Consideration was not reported.

Regular Postwar Gasoline Expected To Be 80 Octane

by Arch L. Foster

BRUCE K. BROWN

NEW YORK. — "Immediately after the war we can expect that the average octane number level of motor gasoline may increase as much as three units (A.S.T.M.) over immediate prewar values," said Bruce Brown, assistant deputy petroleum administrator, and Dan Barnard, consultant to the Petroleum Administration for War, in a paper read here last week before several hundred technical and executive leaders of the petroleum and automotive industries. "The majority of marketers will be able to offer housebrand products around 80-octane number and premium products of, say, 85-octane number," these authorities conclude.

These statements are the first carefully considered prophecy of the qualities of postwar motor fuel which have been made in open forum during this war.

Automotive manufacturers, most of them at least, "will get along fairly well," in building automotive engines for A.S.T.M. octane ratings of up to about 85-octane number, said C. A. Chayne, chief engineer of Buick Motor Division, General Motors Corp., in presenting the automobile industry's position to the New York section of the Society of Automotive Engineers. "This can be done (building engines for 85-octane number fuel) very likely with changes that are well within the limitations of existing manufacturing equipment," Chayne continued. "When we get past 85 and start into the 90's the going will be tough for all of us," Chayne stated.

Modern 100-octane aircraft engines are not sufficiently sweet and smooth-running to try to sell to a car owner, it was stated at this meeting. When "souped up" to operate efficiently on 100-octane fuels, even these fine engines, running at a peak cylinder pressure of 1,200 lb. per sq. in. and more are extremely noisy. Such engines as we are now using by the thousands for war cost 10 times as much per horsepower as does a typical prewar car engine, which runs at about 600-lb. peak pressure. The heads of the cylinders of these radial superengines twist back and forth out of line by as much as ⅛ in. during takeoff, Chayne remarked. Such conditions have not been mastered in car engines and the noise and clatter in a car with such engines would drive away the prospective owner.

Gradual Rise Expected

Considering the trend of octane numbers for 5 years after the war, Chayne showed general curves and stated he believed the A.S.T.M. octane number will rise gradually during that period up to 87 or 88 for house-brand products. Premium gasoline will be increased close to 100 A.S.T.M. octane, he indicated, during a period which will give the engine maker a reasonable time in which to build suitable and marketable engines to use these fuels. The "advertised octane number" of postwar fuels will probably reach astronomical figures which will influence sales and will raise the actual rating higher than the technologists will find necessary.

Brown and Barnard stated that a third-grade fuel to take care of engines not requiring 80 or 85-octane number will be made available, with rating somewhere below 80 and determined probably by postwar competitive conditions.

Two factors will control design of engines and fuels in the postwar period, this meeting brought out. One factor is that radical changes in engines must be made to enable them to use efficiently fuels of octane numbers appreciably higher than about 85. Engines must "be stiffer," Chayne stated, in order to withstand terrifically increased pressure and stresses set up by peak compression. The best alloys developed must be used and engine builders must learn how to use them to best advantage. Asked if air-cooled engines will "get a play" for postwar motor cars, Chayne deprecated the idea on several grounds, pointing out that positive cooling is more necessary as compression pressures and output rates rise, also that stiffness of engines is the more necessary under these accentuated conditions.

The all-important factor in fuel is the conservation of crude petroleum. J. F. M. Taylor, vice president of Shell Development Co., in discussing the subject, pointed out that fuel quality will be determined by competition, set by the automotive companies. Twenty years ago, Taylor stated, we consumed 1 gal. of oil as fuel, losses, etc., in refining 1 bbl. of crude. Now we burn or otherwise destroy 6 gal. of oil per barrel of crude refined, leaving our effective barrel at only 36 gal. With dwindling crude supplies we must at all costs conserve those supplies by destroying as little of the crude as possible, he declared.

"Some aviation-gasoline components should be quoted in cents per pound, rather than in cents per gallon," Taylor stated significantly, emphasizing their expensiveness, excusable in wartime but indefensible as motor-fuel components under peacetime conditions.

One gallon of alkylate consumes about ¼ gal. of crude, it was stated, an excessive cost in peacetime, regardless of resulting performance. Taylor mentioned two illustrations: "Private automobiles attain 20 to 30 ton-miles per gallon of fuel, while transcontinental buses for example return 75 to 100 ton-miles per gallon, and at the same time these buses perform at so fast a pace that few automobiles can match it. Such performance, Taylor indicated, can be built into cars with our present engines and fuels if only these industries each does its part in providing the advances needed. Taylor believes also that diesel-engine fuels may not be cracked for motor gasoline so much in future, when war debts may make economy a more paramount factor, in view of the inherent efficiency and thus the economy of the diesel cycle.

Introducing the economy interest into the picture, Brown pointed out that while at the end of this war we shall have large capacity for catalytic cracking, probably only those units

(Continued on page 107)

Diplomatic Support Held Preferable to Government Ownership of Foreign Oil

by J. P. O'Donnell

BALTIMORE, Md.—A policy "which encourages private American oil companies to expand interests in foreign fields and gives them the support that is requisite on the diplomatic front" is favored by Sen. Ralph C. Brewster of Maine. Brewster, a member of the Truman committee and one of five senators who recently toured the world battlefronts "to look carefully into the petroleum situation," suggested such a policy in an address here last week at the dedication of the new Standard Oil Co. of New Jersey 100-octane refinery.

"We were startled and disturbed to find that the United States was furnishing approximately 80 per cent of the petroleum consumed by the United Nations while Great Britain was furnishing about 8 per cent although no estimates indicate that the United States has 10 times the reserves of Great Britain.

"This problem focuses the issue as to what American policy on petroleum shall be in the present and in the postwar world.

"Three courses are open to our Government in justice to future generations," he declared.

"One is to continue the present haphazard situation with confusion among the various government departments concerned and with a policy which seems to promise the exhaustion of our petroleum reserves within another 20 years and the impossibility of the United States being able, as Secretary Ickes points out, 'to oil another war.'

"One is for the Government to go into the oil business in foreign countries either entirely on its own account or in partnership with private companies. Such a project has been more or less seriously proposed although it is evident that it would involve a radical change both in foreign and economic policies and would have implications it would be difficult to comprehend.

"The third course would seem to be more in accordance with American tradition and precedents and to offer more certain prospects of success.

"The enterprise and genius of American businessmen have made possible the tremendous petroleum development of America in the last half century. It is not too much to say that the success of the United Nations in this war rests like an Atlas upon the potentialities of the petroleum industry of the United States. While we shudder at the draft on American resources, we may be profoundly grateful that the refining capacity and transportation facilities were available to enable the United Nations to win the war.

"This achievement is a tribute to the vitality of private enterprise.

"Would it not seem prudent and proper in the first instance for the United States to adopt a petroleum policy which encourages private American oil companies to expand interests in foreign fields and to give them the support that is requisite on the diplomatic front?"

In prededication ceremonies at the Maryland Academy of Sciences, Ralph W. Gallagher, president, Standard Oil Co. (New Jersey); Chester F. Smith, president, Standard Oil Co. of New Jersey; and R. O. White, president, Baltimore & Ohio, were speakers. Robert T. Haslam, director, Standard Oil Co. (New Jersey), spoke at a meeting of the Advertising Club of Baltimore.

New Challenge Presented

Reminding his audience that tasks ahead provide a new challenge for scientists, Mr. Gallagher summarized examples of how scientific research in his company had created new weapons for war. "We learned how to make toluene from oil. Today two-thirds of the bombs dropped on our enemies are made from synthetic toluene," he said.

"We learned how to make 100-octane gasoline and thus enabled the United States and Great Britain, as early in 1936, to redesign airplane engines to give our fliers superiority. We learned how to make synthetic rubber from oil, and this knowledge enabled our country to avoid disaster when the Japs took the Dutch East Indies."

In the oil industry, Haslam said, it is recognized that the Arctic region is one of the four most likely areas in the world in which to find petroleum. Others which some day may yield rich stores are in the Near East, the area between Australia and India, and the Caribbean region.

PRC Purchase Program Fading

WASHINGTON, D. C.—Evidence is beginning to accumulate to suggest that the Petroleum Reserves Corp. may never go through with plans to buy its way into American oil companies operating abroad and to put the federal Government directly into the foreign oil business.

The full purport of such proposals is beginning to sink in on various members of Congress and they are none too pleased with the idea. Direct government participation in foreign commercial business would be a direct departure in U.S. foreign policy, and one which Congress would want to examine carefully.

PRC appears to be chiefly a postwar agency, and all that can be learned of its activities and program indicates an intention to engage directly in the production, refining and transportation of oil, either in partnership with private corporations or in competition with them.

Two or three congressional committees may look into this subject in the near future. Chairman Clarence F. Lea of the House committee on interstate and foreign commerce has announced that his petroleum subcommittee will ask Secretary Ickes to tell about PRC as soon as convenient.

Ickes said last week that his petroleum mission to the Middle East had finally left this country after a delay in obtaining transportation. There are rumors in the industry that the mission is seeking concessions for PRC in territories in dispute between two local governments.

Tanks and dock near Norman Wells in Canada where Army expenditures are under fire by the Truman committee

THIS WEEK

REFINING—District 2 refiners see little relief from crude shortage, resulting from DSC reimbursement plan. . . . Assert incentives are not adequate, most will sit back until Stanolind Pipe Line Co. line is finished next April. . . . Government discouragement may prevent Middle West plants from fulfilling goal of 80,000 bbl. daily of 80-octane all-purpose gasoline for shipment to East Coast. . . . ¶Bruce Brown, PAW director of refining, doubts that more expensive wartime plants can be fully justified in postwar economy. . . . Anticipates regular-grade gasoline will range around 80 octane. . . . Processes most wasteful of crude eyed askance in postwar outlook. . . .

DRILLING—Completions last week dropped slightly but accumulative total for year will move ahead of the 1942 rate. . . . Oil wells are running 55 per cent of total completions, failures are slightly under 30 per cent. . . . Trend accelerated to deeper exploration of known producing structures. . . .

TRANSPORTATION—Only 2 miles of line remain to be laid on eastern end of 20-in. products line. . . . ¶California receiving 45,000 bbl. of petroleum products daily from Texas refineries. . . . Movement may rise to 80,000, when tank cars are available. . . . Five thousand tank cars currently assigned to West Coast movement, loading and discharging about 200 daily. . . . ¶Break in WEP 24-in. crude line in Ohio repaired. . . . Interruption in runs used for installation of gate valves on eastern extension. . . . Deliveries to East Coast reduced 700,000 bbl. by time lost. . . . Eastern storage, adequate, however, to maintain refinery operations. . . .

MATERIALS—PAW concentrating on arranging manufacturing schedules for bearings and pumping units. . . . ¶Critical condition of tool-joint supply easing, further improvement in prompt prospect. . . . One manufacturer shifts 300 skilled workers from ordnance production to tool joints. . . . ¶Army and Navy materials representatives adjusting manufacturing schedules and contracts were possible, and necessary, to unblock barriers to essential oilfield equipment. . . . PAW representatives say it makes a great difference when military "is working with you instead of against you." . . .

PRICES—Oil men and congressional delegations make final plans for test on Disney price bill next week. . . . Farm and coal blocs feared ready to hitchhike ride to higher prices along with oil via amendment route. . . . ¶Cents per gallon ceilings fixed by OPA on inland Texas, Arkansas and North Louisiana refinery shipments of gasoline, fuel oil, according to destinations. . . .

INTERNATIONAL—Ickes discloses plan for controlling world petroleum resources, as a means to lasting peace. . . . Advocates direct participation in foreign properties by government ownership. . . . ¶Sentiment swelling in Congress for diplomatic support of American national companies, possibly thwarting Petroleum Reserve Corp. plans. . . .

Ickes Confirms Previously Denied Policy On Foreign-Petroleum Ownership

by Henry D. Ralph

WASHINGTON, D. C.—Some of the Government's plans for engaging in foreign oil operations both during and after the war were revealed officially for the first time in an article by Harold L. Ickes in the current issue of the American Magazine.

The article confirms many reports which have been circulating in the oil industry but which have either been denied or refused comment by Ickes and officials of the Department of the Interior, Petroleum Administration for War, and Petroleum Reserves Corp.

Ickes admits in the article that PRC, which he heads, was formed with the idea of engaging in foreign oil operations in a sort of financial and managerial partnership with American oil companies on the British pattern.

He says he is not committed to the British petroleum policy in detail but he shows rather clearly that he believes the PRC should have a stock interest in United States oil corporations operating abroad. He singles out for mention operations of the California Arabian Standard Oil Co. in Saudi Arabia and the Gulf Oil Corp. in Kuwait, as illustrative of his point.

However, a few weeks ago Ickes and his associates refused all comment on published reports that PRC was attempting to purchase a stock interest in California Arabian Standard Oil Co. They also refused to reveal the purposes for which PRC was formed or to discuss its current plans or activities, asserting that it is too closely linked with war programs to justify disclosure of details.

The article also gives portions of an Ickes postwar plan for oil, including the building up of tremendous storage of petroleum in tanks, dependence on imports, and a system of international sanctions whereby the victorious United Nations would control all the world's oil and prevent others from obtaining any for military purposes.

When somewhat similar reports were printed recently, Ickes took occasion at a press conference to deny them and declared that he had no postwar oil plan.

In his article Ickes assumes that the United States can never again be self-sufficient in petroleum, but must depend on imports to a considerable extent. He suggests "repayment in kind" for oil exported from this country to assist other nations in fighting the war. He says it is his fixed conviction that the petroleum of the world belongs to the people of the world, leaving the inference that this requires government control rather than operations by private companies.

In discussing the PRC, Ickes says that the day is rapidly approaching when this Government must take more than a casual interest in foreign fields where concessions are or may be acquired by American interests, and then adds this paragraph:

"The Petroleum Reserves Corp. will attempt to explore and encourage the national interests of the United States in the petroleum fields of the world where private industry is willing to go, and to propose safeguards for those interests."

More Data Presented Supporting Higher Ceiling Price for Oil

WASHINGTON, D. C. — Arguments for increasing the price of crude petroleum were reviewed again by the Lea committee of the House this week, apparently in preparation for debate on the Disney bill which is expected to be brought up for a vote December 13.

Spokesmen for the Independent Petroleum Association of America, chief advocate of higher crude prices, were called by the petroleum subcommittee to summarize the current situation regarding petroleum supplies and to review the reasons why legislative action is being sought to force a higher crude price.

Russell B. Brown, general counsel of I.P.A.A. reminded the committee that its previous series of hearings have revealed evidence that present petroleum reserves in this country are not sufficient to meet all military and essential civilian demands, and also that producers are not obtaining sufficient revenue to support the necessary exploratory effort to develop new reserves because an abnormally low crude price was frozen by the Office of Price Administration.

Pointing out that all government agencies that have studied the oil situation are in agreement that there should be some incentive for greater exploratory work, Brown said the present question is between a price increase or some sort of government subsidy or bonus but that no workable plan for a subsidy has been devised.

The oil industry, he said, is unwilling to accept the defeatist theory now receiving some attention, that we have reached the practical end of our discovery possibilities. Imports should be used to the extent that they can relieve the oil shortage during the war, he said, but little hope for domestic consumers can be expected in this direction, and the Government should give at least as much attention to developing more domestic sources as to expanding foreign operations.

Brown criticized the philosophy behind the Petroleum Reserves Corp., as recently expounded by Secretary Harold L. Ickes, and Chairman Clarence F. Lea of California announced that Ickes had been asked to tell the committee about PRC but he had asked to postpone this until he has completed current coal-wage negotiations.

Committee members asked the I.P.A.A. to supply data showing current costs of producing oil as compared with prices now and a few years ago, and also any data available as to profits of various branches of the oil industry. Chairman Lea remarked that refusal of government

agencies to increase the price of crude has been based on legalistic and arbitrary grounds and apparently has ignored the question of the reasonableness of the price of crude and its relation to the cost of production.

Rep. Clarence J. Brown of Ohio asked the witness' opinion of an increased price conditioned on use of the additional funds for exploratory effort or increased production through secondary recovery or reworking of old wells. He suggested that a certain limitation be placed on the profits of crude producers and beyond that the Government recapture 100 per cent of income from a price increase unless such funds are used in exploration.

Ralph T. Zook, president of I.P.A.A., undertook to refute the contention that major producers are already making large profits at the present crude price. He introduced comments by the heads of several companies regarding Vinson's statement that producers' earnings are satisfactory based on capital investment, including O. D. Donnell, Ohio Oil Co.; L. S. Reed, Texas Gulf Producing Co.; Walter S. Hallanan, Plymouth Oil Co.; John M. Lovejoy, Seaboard Oil Co.; E. B. Reeser, Barnsdall Oil Co.; W. G. Skelly, Skelly Oil Co., and J. R. Penn, Texas Pacific Coal & Oil Co.

Profits From Old Wells

These comments agreed that profitable production is from old wells and fields discovered some time ago which are now producing at their maximum rate; that crude assets are being liquidated below replacement costs, and present prices make it impossible to undertake sufficient exploration to maintain reserve position of these companies.

Zook said his company is showing more profit than last year but at the same time is going out of business and has recently had to drop plans for two secondary-recovery projects because the cost of the oil obtainable was above the ceiling price. He declared that Congress and administrative agencies in refusing to raise the crude price must assume the responsibility for this country being unable to meet oil requirements in 1944 and consequently for a further curtailment of civilian gasoline use.

Gov. John J. Dempsey of New Mexico told the committee that unless more oil is discovered soon there must be further gasoline cuts and this will seriously disrupt the domestic economy and interfere with the war effort. He said he and the governor of Kansas recently wrote all state governors and of 25 replies, including many from nonproducing states, all but one favored an increased oil price. Dempsey said he has recently talked with Vinson, Byrnes and Bowles and all agreed there must be additional incentives for oil discovery and production though they are not agreed on the urgency and the method, so it is the responsibility of Congress to provide the incentive at once and a price increase is the only practical means. He said federal taxes would easily recapture most of the high profits which might come to producers from old and low-cost fields.

Statements favoring a higher crude price were filed by J. C. Hunter for Mid-Continent Oil and Gas Association, and Merle Becker of W. C. McBride, Inc., St. Louis, Mo., producing company, the latter analyzing profit statements to show that oil-company earnings are not due to a high price for crude in comparison with current production costs.

Texas Co. Checking Lewis and Selby Properties in Five States

NEGOTIATIONS are expected to be completed this month for merging Lewis Production Co., Selby Oil & Gas Co., Montour Production Co., and Arthur Brewer Co., producing units operating in Texas and Mid-Continent fields, into Texas Co. Consideration was not revealed, pending completion of current checks on properties.

Checking of properties and taking of inventories are proceeding on a basis of exchange of Texas Co. stock for shares of the four producing organizations. No cash is involved in negotiations as they have been discussed thus far. Properties of Lewis Production Co., headed by George Parker, San Antonio, Tex., president; C. L. McCune, Pittsburgh, Pa., vice president, and George Streeby, Tulsa, assistant secretary and treasurer, are the most extensive of all involved in the trade. Lewis has a gross of 550 wells, Montour has 75 and Brewer about 45. Selby's wells and production were not disclosed but are fewer and less than currently operated by Lewis.

Lewis Production Co. properties are scattered in Texas, Oklahoma, Illinois and Indiana; Selby operates in Texas, Oklahoma and Kansas; Montour is confined to Texas, and the Brewer company operates exclusively in Kansas. Daily net production of the Lewis company is about 3,750 bbl.; Montour has 350 bbl., and Brewer about 450 bbl.

The Lewis company has approximately 9,400 acres in producing properties divided, 4,200 in Texas, 3,600 in Oklahoma, and 1,600 in Illinois and Indiana. Montour has 2,150 acres in producing leases and Brewer about 2,300. Undeveloped acreage of the Lewis company totals approximately 60,000 acres in the four states in which it operates.

Montour is owned within the Lewis closed corporate structure with the same officers. Arthur Brewer, Winfield, Kans., is vice president of the company bearing his name and Parker is president. If the negotiations are consummated, it will be the third sale of properties built up by the Lewis organization. In 1926, Lewis Oil Co. sold its Texas, Oklahoma and Kansas producing properties to Texas Co., and 3 years later, Lewis Production Co. sold its Burbank, Oklahoma, property to Vacuum Oil Co.

Reservoir Management Features Compact Program

OKLAHOMA CITY, Okla.—Greater oil and gas recovery by cooperative reservoir management through petroleum industry engineering committees will feature the program of the Interstate Oil Compact Commission at its winter quarterly meeting in Wichita, Kans., December 10-11.

V. E. Cottingham, chairman of the North Basin Pools Engineering Committee, Midland, Tex., will address the general session which convenes at 2 p.m., December 10, in the Broadview Hotel, on the subject "Oil-Field Operation With Cooperative Engineering Committees."

Cooperative reservoir control in the K.M.A. field will be discussed by W. H. Rouzer, Jr., field engineer of the K.M.A. Pressure Maintenance Association, Wichita Falls, Tex.

Officers will be elected, standing committees appointed and plans for the ensuing year completed at the Saturday morning session which will adjourn at noon.

Texas Fields to Be Linked With New Pipe Line

A new pipe line is scheduled to be built from the Pettus field of Bee County to the Porter field of Karnes County, and from the Porter field to the Slick-Wilcox field of De Witt-Goliad County, reports from Southwest Texas stated late last week. Bill Scurlock of Houston, Tex., is said to have the contract, and survey for the line has already been completed.

Gas Turbine Practical, A.S.M.E. Is Told

NEW YORK.—Four thousand mechanical engineers have wrestled for 5 days with the innumerable problems which the engineers of this country are facing, in the Sixty-fourth annual meeting of the American Society of Mechanical Engineers at the Hotel Pennsylvania here last week. The fields discussed ranged all the way from cumbersone slow-speed diesel engines driving ships and electric generators to the rapidly developing technology of wood-and-plastic materials for constructing peace-time airplanes.

Excess-air control in fuel combustion may be carried out with the aid of suggestions and curves discussed by Robert Reed of the John Zink Co., Tulsa. Reed showed curves by which the amount of excess air can be controlled positively by either carbon dioxide or oxygen content of flue gases. By this means, he said, any changes in fuel composition or properties may be compensated by proper manipulation of the controls. A given oxygen concentration in the flue gases indicates almost exactly the same excess-air factor, whether the fuel be natural gas, liquid fuel or coke. The relationship between oxygen concentration and excess air percentage is independent of the CO_2 concentration in the flue gas. So, CO_2 concentration is usable merely as a means of checking the flue gas analysis against the hydrogen-carbon ratio of the fuel, he stated.

Test for Aldehydes

While the presence of aldehydes in flue gas is indicated by failure of the Orsat results to check with the hydrogen-carbon ratio this indication is not accurate enough. Two-tenths of a gram of "certified basic fuchsin" is dissolved in 10 cc. of a saturated cold-water solution of sulfur dioxide and is allowed to stand until all red color is lost and the solution is either colorless or pale yellow. It is then diluted to 200 cc. and protected against light and air in a tightly stoppered dark bottle. Fifteen cubic centimeters is placed in a flask and is connected to the flue gas source by a tube from which all air has been removed. Gas is bubbled through the solution for 2 minutes or more, and if any pink, red, purple or blue color appears after 2 minutes more, of standing, the presence of aldehydes is indicated, proving incomplete fuel combustion.

Gas turbines have been studied for several hundred years, Prof. C. R. Soderberg of Massachusetts Institute of Technology mentioned, and pointed out that modern engine superchargers exhaust-gas driven are the most successful development of such a turbine. Gas turbines must operate successfully at 1,200° F. or higher temperatures, a dull red heat, and their development was forced to wait on metallurgical advances to produce the required alloys to withstand the temperatures involved. This has been accomplished in superchargers. The outlook for gas turbines has changed "overnight," this authority stated. Commercial developments are expected soon after the war ends. It is believed that gas turbines for locomotives and ships can be built which will outdistance the diesel engine and the steam engine both in weight and in power developed as well as in operating economy.

The Smith master-valve engine, introducing a new note into engine research, was presented in a paper by Prof. Byron E. Short of the mechanical engineering department, University of Texas, and T. N. Smith, Jr., of Luling Oil & Gas Co., San Antonio, Tex. In this engine the regular inlet and exhaust valves are provided but between the valve chamber and the cylinder proper a large master valve is installed. This master valve is operated as follows: At the beginning of the exhaust stroke both the regular exhaust valve and the master valve are opened. When the exhaust stroke is complete the exhaust valve closes but the master valve remains open as the inlet valve opens and admits a fresh charge of fuel-air mixture. When the intake stroke is completed both inlet and master valves close, the compression and power strokes follow in succession, after which master and exhaust valves open to complete the cycle.

A single-cylinder engine built on this principle has been operated at speeds of 1,200 to 2,400 r.p.m., connected to an electric dynamometer, operating with a compression ratio of 9:1. A specific fuel consumption of 0.43 lb. per horsepower-hour is reported. Friction and pumping losses appear to be high, the authors stated. The mechanical efficiency is about 70 per cent at 2,400 r.p.m., instead of around 80 per cent in the average automotive engine of conventional design. Exhaust temperatures are rather high, of the order of 1,000° F. Since it would be expected that the greater compression ratio would cool the exhaust gases below the temperature of gases from a lower compression engine, the senior author believes that the adaptation of the operating conditions has not been developed to a satisfactory degree.

The strict rationing of motor fuel in Great Britain has given great impetus to means and methods for gasifying solid fuels such as coal and coke for fueling automotive equipment. This equipment consists usually of burners wherein air with added water is drawn through a bed of coal, coke, wood or other fuel yielding a mixture of carbon monoxide and hydrogen. Engines operating on such fuels are slower to start than when operating on gasoline, develop only 50 to 60 per cent of their normal power and the assemblies are normally very cumbersome and inconvenient, W. C. Schroeder of the U. S. Bureau of Mines stated. The gas so produced showed about 120 to 130 B.t.u. per cu. ft.

A slightly abridged version of paper on the postwar outlook for diesel fuel oil presented at the A.S.M.E. meeting by the Journal's refinery editor, Arch L. Foster, appears on pages 34, 35, 36 and 39.

Texas Governor Still Fighting Big Gas Line

AUSTIN, Tex. — Gov. Coke R. Stevenson of Texas may make another effort to block construction of Tennessee Gas & Transmission Co.'s 24-in. gas line from Gulf Coast fields to West Virginia. He said last week that he would write the U. S. Army Engineers at Galveston where application for river-crossing permits is pending, but he did not explain whether he would make another attempt to halt the project. Engineers must approve crossings at five navigable rivers in Texas to implement the project.

The governor has been informed that the only question for the Army to decide is whether the crossings will interfere with navigation.

Stevenson said that he has been unable to get a clear picture of Texas gas resources, the variance of prices paid at the well, and related questions.

Railroad Commission Chairman Beauford H. Jester said recently that he would recommend a series of hearings on availability of gas production, similar to hearings held by the commission last summer on oil.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

The Only Basis for Peace

PRESIDENT GALLAGHER of Standard Oil Co. (N. J.), in a few words, pointed to the only guarantee against future wars when he told the Maryland Academy of Science that "continuing peace after the war depends upon the ability to raise the standard of living of other nations."

Allied leaders are now engaged in agreeing on plans for bringing about important changes in world affairs at the conclusion of this war with an enduring peace as the primary objective. But this peace, as all the others that have preceded it, will be subject to the test of whether it contributes to the economic welfare of all nations as reflected in improved living conditions. If it fails in that test the best-laid plans of statesmen will be for naught and important segments of the world's population will shortly again prepare for war.

Cheap power is the most important factor in achieving this peace objective of better living of which everyone now knows and petroleum is the principal source of this power. Realizing this, Mr. Gallagher, the operations of whose company are world wide, said the job ahead for oil men is "to find more oil and better ways of using it; to help our neighbors in other lands find more oil and use it better."

This is not an impossible task as some have assumed, provided those who have advanced the petroleum industry to its present status and those who succeed them, are permitted to exercise the initiative required for such an accomplishment.

Most of the possible oil areas of the world have not been explored. At the moment the tremendous reserves that have been discovered in the Middle East in recent years are the subject of discussion within and outside the oil industry. Yet thousands of oil men, now living, can recall the predictions made in the twenties and earlier that this vast Asiatic area would never produce. Adjoining the Arctic area, what was believed to be a small pool is now established as an important reserve opening another section for further exploration.

What the possibilities of these and other discoveries are and what can be found in other parts of the world can only be determined by intensive development over a period of years. There is every reason to believe that the discoveries can keep pace with the demands as they come from peoples whose per capita requirements are now only a fraction of those in this country.

There is also an answer to those who insist on being pessimistic with their contention that most of the world's petroleum has already been discovered. The cheapest method now known to secure "hydrocarbon power" is from crude oil. Those who are endeavoring to establish a sound basis for human relations through an equitable distribution of those things that make for peace do not have to anticipate a crisis through world shortage of oil.

Fortunately there are unlimited sources of hydrocarbons and the scientists and technicians, if necessary, are in a position to make them available at costs which will permit their use in any conceivable economic development. These accomplishments in supply are being paralleled with greater efficiency in utilization.

This proposal to make natural and synthetic petroleum universally available assumes the cooperation of governments everywhere and guarantees for the continuance of private enterprise so far as this country's nationals are concerned. The petroleum foundation for better living must be universally recognized as such and then fostered in international agreements and within nations.

Future for Diesel Engines

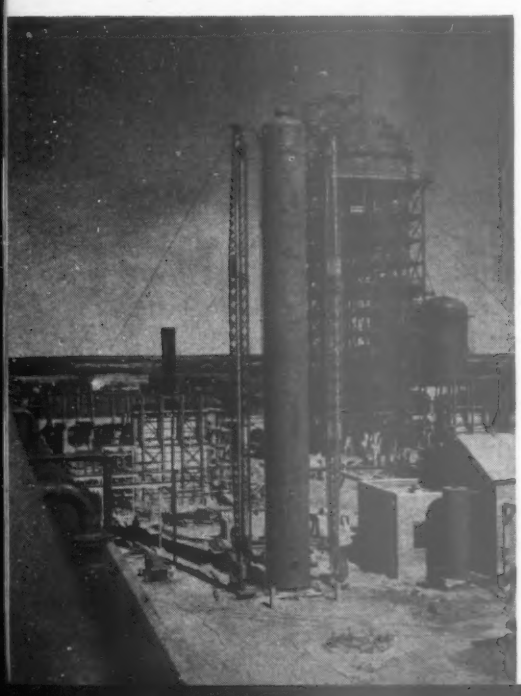
by Arch L. Foster

This is a slightly abridged version of the paper presented last week by the Journal's refinery editor at the oil and gas power session, annual meeting of the American Society of Mechanical Engineers at New York. Before joining the Journal's staff, Foster received a master of science degree in chemistry from Texas University and spent several years in petroleum research and development work with Gulf Refining Co., Bureau of Mines and Phillips Petroleum Co.

SPEAKING before the Society of Automotive Engineers in Cleveland, Ohio, last June a fuels and lubricants technologist stated, in part,[1] "After World War 2 . . . the extremes between octanes for gasoline engines and cetanes for diesel engines will broaden in favor of high octanes to the detriment of diesel fuel ignition quality." Also, he later remarked in this paper: "At the rate production of high octane aviation fuels . . . is going ahead at the expense of kerosine and distillates (the source of diesel fuels), suitable diesel fuels will be on the critical list by 1944."

While we cannot but agree, qualitatively, with these general conclusions which amount almost to prophecies we believe the postwar future of the diesel engine is of far greater importance in our deliberations and thinking than is any suitation which concerns only the necessarily abnormal period of the war. Essential diesel engine operations will be supplied with reasonably satisfactory fuels in reasonably satisfactory amounts, simply because it is necessary to proper and successful prosecution of the war, and variations from this wartime norm will be due to the difficulties of transport, supply and the foreseeing of supply requirements under wartime conditions.

[1]C. M. Larson, "Octanes or Cetanes After World War 2?", S.A.E., Cleveland, Ohio, June 2-3, 1943.



Fractionator and fluid catalytic cracking unit in background nearing completion at Associated Refineries, Inc., plant near Duncan, Okla.

Viewed through the roseate glasses of the spark-ignition motor-fuel manufacturer, the refiner, the world situation is changed radically. Generally speaking it is axiomatic that the best diesel engine distillate fuels are among the best charge stocks for the thermal-cracking unit for high-octane-number gasoline production. Also, the "recycle" oil—partially but insufficiently cracked oil which has passed one or more times through the cracking still—from these thermal units has deteriorated in diesel fuel qualities, especially in cetane number. Therefore, so far as thermal cracking for motor fuel is involved, competition for these stocks for the two purposes is direct and the utilization of them will be determined on practical economic principles.

To obtain a partial view of the situation as to diesel-fuel supply and the expectable demands on the petroleum fractions from which diesel fuels are drawn; from Bureau of Mines statistics available before censorship stopped their publication, we note the production of distillate fuels and gasoline as of the dates given, from the crude processed in Table 1.

It is noted that a small but gradual uptrend in distillate-fuel production accompanied a decided drop in motor-fuel output from 44.6 per cent to 37.2 per cent. These indications are not at all conclusive, since several effects of the war situation impinged on the production, and these data cannot be considered typical of normal operations. They show that the production of distillate fuels from which diesel fuels are drawn at least did not decrease during that period. What the conditions of price or of emergency demand were at that time is known in general by all diesel-engine operators.

Economics of Refining Fuels

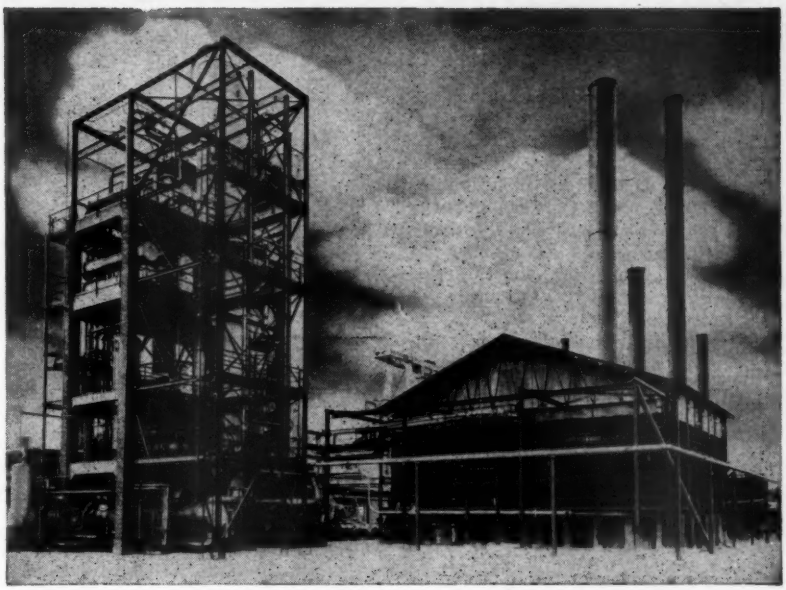
Introductory to some calculations of the relative costs and returns from refining diesel and spark-ignition fuels (gasoline), note the prognostications of the ignition rating of motor and diesel fuels for the future.[1] Housebrand gasolines will be 80 octane number, as compared to 70-75 before the war; premium-grade fuels, 87-90 octane number; third grade, 72-75 octane number, equivalent to regular grade in 1941; tractor and distillate fuels, 50 octane or 40 cetane numbers. Crediting for purposes of assumption, at least, that these estimates are correct, the refiner is faced with the problem of net returns from the conversion of his distillate fuels either to diesel or motor fuels. While relatively small alterations in price can change any of these hyothetical or actual conditions very appreciably, the following calculations are based on current prices for the commodities mentioned.

Also, to consider the amounts of motor fuel and aviation fuel which may be made in comparison to that which has been made in the past, the total of these two fuels produced

TABLE I

Date	Thousands of barrels: Crude processed	Dist. bbl.	Fuel oil % crude	Motor gasoline	Motor gasoline % crude
January 1942	119,032	16,902	14.2	53,049	44.6
June 1942	105,376	15,210	14.4	39,827	37.8
December 1942	113,342	18,073	16.0	42,116	37.2

in December 1942 has been estimated at somewhat less than 1,500,000 bbl. per calendar day. With a drop of 20 per cent or more in motor-fuel production, and with unknown but privately estimated aviation fuel increases the total for 1943 is expected to be slightly larger than this overall amount. Much of the increase in aviation fuel will derive from good quality gas oils. Consequently, it is estimated that the total volatile fuel produced per day by the end of 1943 may require as much as 100,000 bbl. additional gas oil. Some 210 million barrels of distillate fuel oil were produced in 1942. Assuming an equivalent potential production in 1943, the 36,500,000 bbl. required for additional volatile fuel for this year, or production at that rate by the end of this year, still leaves about 175,000,000 bbl. of distillate fuels for all purposes, not including the recycle oils obtained from cracking processes as byproducts.



A polyform unit at a midwestern refinery of Socony-Vacuum Oil Co., Inc.

Relative Costs

Fortunately, as to qualities, specifications and property requirements, costs, etc., for diesel and motor fuels, more exact information is available. Assume, for the sake of indicative calculations, a refinery price for medium grade diesel fuel of 4 cents per gallon for, say, 35-40 cetane number. At the same time at the same place, housebrand gasoline of 70-72 octane number sold for 6 cents per gallon, a margin of 2 cents in favor of gasoline. The refiner must pay for cracking costs, cracking losses, degradation of cracking plant charge stock from this 2 cents and still break even or else he will profit better by selling the distillate fuel as diesel oil at 4 cents without incurring the additional cracking costs.

Thermal cracking costs vary so widely that it is hardly worth while to assume such figures. Cracking losses vary widely, too, but assuming a 15 per cent loss in cracking these potential diesel fuels, 10 per cent of degraded (partly cracked) distillate fuel oil, and 75 per cent gasoline by thermal cracking, we find that the total gross return from a barrel of the fuel oil is $1.68. Gasoline at the going price, 75% of 42 gal., yields $1.94; 4.2 gal of heavy fuel oil, refractory-recycle (partly cracked) stock, 10 per cent yield at $1.50 per barrel, brings in 15 cents, for a total of $2.09 by thermal cracking of this same 42 gallons of distillate (diesel) fuel. Therefore, the additional return at these prices for the refiner to crack fuel oil to gasoline is 41 cents per barrel or about 1 cent per gallon. The refiner may make a small paper profit at this price differential.

Assume again a tank-wagon price of 9.5 cents per gallon for housebrand gasoline, 8.1 cents per gallon for diesel fuel in your run tanks. Total gross return for diesel fuel at this price is $3.40 per barrel. With the same yield-loss assumptions for thermal cracking as used above, the return from gasoline from a barrel of fuel oil is $3.34, a loss of about 0.2 cent per gallon as compared to selling the fuel oil (cracking charge stock) as diesel fuel. Assuming another actually reported set of typical tank-wagon prices for these two products, 7.2 cents for diesel oil and 9.3 cents for gasoline, by the same calculations a barrel of distillate fuel oil will return $3.238 as gasoline, $3.030 as diesel fuel, or a gasoline advantage of approximately 0.5 cent per gallon of the original charge stock which can also be sold as such for diesel fuel or for furnace oil. As a result of these various price estimates, the refiner can realize a profit making gasoline to the extreme yield in the first instance, can possibly break even on the third situation and will profit best by selling the distillate oil as diesel fuel in the second instance.

These data apply specifically to thermal cracking under conditions approximating those obtaining before World War 2 began. At that time 100 - octane - number aviation fuels were used in relatively small amounts. Every indication is that this fuel will be in much greater demand, with much higher octane number ratings required after the war than before. This quantity required is a large "X" looming strong in the refiners' postwar equation on which as yet only qualitative estimates may be made safely. One good authority has estimated that within 2 years after the war, peacetime 100 - octane - number aviation fuel will be demanded as much as five times above the prewar demand for 91-octane-number fuels.

Fuels of these aviation qualities require catalytic cracking of heavier fractions to produce the properties which are so indispensable to aviation fuels. Motor fuels will require thermal cracking, and doubtless in addition a considerable amount of catalytically cracked fuel to attain the 80 to 90 octane numbers prophesied for postwar fuels. Thermally cracked fuels are not satisfactory for aviation purposes. Consequently thermal cracking will be applied entirely to making motor fuels. Catalytically cracked gasolines may be used for both purposes. Yields of finished catalytically cracked gasoline range from about 40 per cent to about 55 per cent, with 40 per cent to 50 per cent recycle gas oil; that is, gas oil which has passed through the cracking unit at least once.

It is in recycle oil that a ray of hope appears for the diesel-fuel user; not for the production of large quantities of first-class, high cetane number diesel fuel but for relatively large amounts of recycle gas oil intermediate in cetane quality, but undesirable for cracking. Data on this point are by no means incontrovertible as yet, but the possibility exists which improves the outlook somewhat in comparison to thermally cracked recycle stocks. Catalytically cracked recycle stocks are less olefinic than those obtained from thermal cracking units and are more aromatic, according to some authorities who have had experience with both products. In this connection, it is possible that combinations of catalytically cracked recycle stocks with ignition-quality-im-

prover additives may offer possibilities for fair-to-good diesel fuels if and when virgin paraffinic stocks reach premium price levels and are unobtainable in the desired quantities at economic prices.

Also, a much more definite and indicative fact is present in the catalytic cracking picture. Paraffinic-base oils are not the best charge stocks for catalytic cracker processes, if much-published data are to be believed. A recent report[2] shows yields of 84-octane-number gasoline from paraffinic gas oils; 87.4 octane number from mixed-base gas oils, and 92.0 octane number from naphthenic gas oils. If other considerations are equivalent, then it may be expected that mixed-base and naphthenic distillate fuels will be premium charge stocks; gasoline from such stocks may be upped to 99 and 96 octane number, respectively, with 4 cc.'s of tetraethyl lead. The margin of advantage for the refiner, over the paraffin-derived catalytically cracked gasoline may make a large difference especially in aviation-fuel production and cost, and when octane number increases well above 100-equivalent for such fuels.

It is highly probable that recycle oils from catalytic cracking units in the refiner's future economy may show better than intermediate cetane-number ratings. Several years ago[3] it was reported that gas oils from recycle stock of the Houdry catalytic cracking process showed considerable improvement over thermally cracked oils of similar boiling range. Ratings of 46 cetane number were quoted for catalytic fuels as compared with 35 or lower for thermally cracked fuels of the diesel type. (See Table 2)

TABLE 2

Cetane numbers of straightrun and catalytically cracked diesel fuels.

Crude	Cetane numbers — Catalytically cracked	Straight-run
Pennsylvania	62	64
Oklahoma City	55	56
Healdton (Okla.)	52	53
Illinois	48	56
Kansas	46	58
South Texas	40	54
Gulf Coast	30	37
Mirando (Texas)	24	28

It is notable that the greatest degradation of cetane number occurs in those oils which are of the naphthenic type which have poor cetane ratings even in the straightrun product, and that in those diesel fuels of highest ignition quality the degradation is least.

Thus, catalytic cracking may well tend to make high cetane number diesel fuels more available than when all of our cracking capacity was of the thermal type. The only direct relief from the disadvantages of the more highly olefinic, thermally cracked diesel fuels with their low-cetane numbers and deposit-forming tendencies is by hydrogenation of these products, a comparatively expensive and uneconomic operation under present conditions. Since higher octane numbers appear to be obtined in catalytically cracked motor and aviation fuels from naphthenic and mixed-base stocks than from paraffinic stocks the trend will be inevitably toward freeing the paraffinic gas oils for thermal cracking or for any other purpose. This trend may be accentuated as more and more cracking capacity is converted to catalytic processes. Remember, too, that catalytic operations may vary widely, changing properties of products correspondingly.

The obligation on the diesel engine designer, to so build his engine that the cheaper grades of fuel may be used with advantage, has not lessened. In fact, that obligation has increased during this war and will continue afterward. One of the two or three main advantages of the diesel engine is economy of operation, of power generation, of fuel cost. If that advantage is lost by building for premium price fuels, it is doubtful in the users' minds if the mechanical efficiency gained by high-cetane fuels will offset the extra cost of these premium fuels. The previously mentioned authority says, "It is up to the diesel engine designer to utilize lower cetanes to the utmost to offset the vast lead the gasoline engine designer, especially the aircraft engineer, has through 100-plus octane fuels which will be available in greater quantities than the diesel fuels after World War 2".

Abstracts of several other papers presented at the annual meeting of the A.S.M.E. are published on pages 69 and 70 of this issue. They deal with wartime-fuel research in Great Britain, corrosion, water conditioning and lubrication.

[2]"Thermofor Catalytic Cracking Process," Oil and Gas Journal, Nov. 12, 1942, p. 96.
[3]"Diesel Fuel in Houdry Distillate, etc." —by W. S. Mount and E. T. Scafe, Proceedings, A.S.M.E., June 1940.

TABLE 4

Effect of solvent extraction on cetane number†

Base of fuel Extracted	Solvent employed	Cetane number before treatment	Cetane number after treatment	Yield, per cent stock	Price* Cents per gal.	Price* Cents per C. N. increase
Paraffin	Furfural	51.5	60.0	76.0	11.8	0.33
Paraffin	Furfural	51.5	63.5	46.0	19.0	0.83
Mixed	Sulfur dioxide	49.0	65.5	54.5	16.1	0.43
Mixed	Sulfur dioxide	49.0	62.5	79.0-	11.4	0.18
Paraffin	Acetone	51.5	58.5	56.0	15.7	0.96
Paraffin	Phenol	52.5	58.5	62.0	14.2	0.87
Paraffin	Phenol	52.5	56.0	77.0	11.7	0.77
Mixed (cracked)	Sulfur dioxide	34.0	59.0	53.5	13.1	0.24

*Based on 9 cents per gallon for raw fuel (7 cents for cracked stock); 3 cents per gallon for extract (2 cents for cracked extract).

†J. Inst. Pet. 27 (214), 348 (1941).

One avenue of escape from the dilemma of low cetane numbers which has not received the attention we believe it deserves from the diesel-engine maker is that of addition of chemicals for improvement of ignition quality.

TABLE 3

Cetane number improvement affected by different additives

Chemical	Cetane number, raw fuel	Increase, by 0.5%/wt. additive	Additive cost per. gal. fuel cents/lb.
Amyl thionitrite	52	13-14	....
Ethyl thionitrite	52	13	....
Amyl nitrite	54	9.5	7.50
Amyl nitrate	56	9.0-	....
Butyl nitrate	56	8.75	....
Sulfur (elementary)	50	7.5	0.07
Diamyl disulfide	50	7.5	....
Tetranitromethane	42	7	....
Diethyl disulfide	..	3.5	....

So far as the author knows relatively small amounts of diesel fuel additives are used to improve ignition quality. The purpose of these additive materials is, technically speaking, practically the opposite of that of tetraethyl lead.

Additives which increase the burnability of diesel fuels under diesel cylinder conditions may improve a poor fuel to the status of a fair or a good fuel, enabling the user to purchase a product which is available theoretically and more than likely actually at a price lower than a high-cetane-number fuel which is not treated with an additive, may be bought. In fact, by the use of additives it is possible to make good fuels available which may be unprocurable at any economic price from straight-run oils.

Still another means of improving poor diesel fuels is by selective solvent extraction, as indicated in Table 4. Here again economics govern decision, based on how much the total return may be for a given product as reflected by the treating loss incurred.

It is therefore desirable that the diesel engine makers advance their prospects by investigating the limits and values of the use of additives to improve ignition quality of their fuels. Numerous chemical products are known and used in some degree

Free Enterprise At Work

What's Behind the Trade Mark?

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THE middle and late '20's were a period of steady growth for The Youngstown Sheet and Tube Company. Following the acquisition of two other steel companies early in 1923, sound policy effected consolidation of the three properties into one strong, unified organization, well diversified in products.

Gradual improvement in general conditions, especially in building construction and the oil industry, permitted Youngstown to prosper. Sales held steady. Selling prices were low, but earnings were good . . . the fruits of farsighted plant improvements and advanced production methods.

It was fortunate, in view of today's tremendous war needs, that freedom of enterprise permitted American manufacturers to earn good profits in the 1920's and to invest those profits in further strengthening themselves. Youngstown's property investment rose from $159,000,000 in 1923 to $223,000,000 in 1929. In those seven years, over $100,000,000 was invested in plant additions and improvements . . . to make steel better, faster. No less important, continuing good earnings permitted the company to dispose of $37,000,000 worth of obsolete, and worn out equipment.

Youngstown has flourished under the system of free enterprise. As a result, it is now in a position to help sustain America in its fight for existence and will serve effectively in meeting the nation's steel needs tomorrow.

Historical Series - - - No. 10

TAPPING HEAT OF ELECTRIC FURNACE STEEL

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which do this effectively. Organic nitrites, such as amyl nitrite, some amines and complex organic nitrogen compounds, and more recently organic sulfur compounds have been tested with strong claims for their efficacy. The refining and spark-ignition engine industries have spent millions of dollars to develop premium fuels, and additives are one of the important, positive results of that research. It seems high time that the refining and diesel-engine industries carry out more far reaching and comprehensive research to determine means by which diesel fuels may be improved and the diesel cycle retain for industry its inherent advantage of efficiency.

Thirty-Six Tankers Completed in November

WASHINGTON, D. C. — Nineteen fast tankers and 17 tankers adapted from the Liberty design were included in the 1,692,700 deadweight tons of new ships delivered in November, according to a statement issued by U. S. Maritime Commission.

This compares with 16 standard tankers and 19 adapted from the Liberty design delivered in October. The 24,000,000-ton goal of ship construction set for the 2 years ending December 31, 1943, already has been exceeded, Rear Admiral Howard L. Vickery, vice chairman of the commission, said.

End of Year to See 72 Plants Making High-Test Gasoline

BALTIMORE, Md.—The end of the year will see 72 refineries making 100-octane gasoline, compared with 22 at the beginning of 1942, Ralph K. Davies, deputy petroleum administrator, declared last week at the dedication here of the 253-ft.-high aviation-gasoline plant of Standard Oil Co. of New Jersey. In addition, refineries will be making some of the ingredients required for high-test fuel.

The refinery, referred to as "Baltimore Giant," was built originally 66 years ago, and is the sixth Esso plant to be converted to the manufacture of high-octane gasoline for war purposes.

Rules for Goldsmith Field Are Not to Be Changed

AUSTIN, Tex.—The application of Gulf Oil Corp. for changes in the rules governing the Goldsmith field, Ector County, has been denied by the Railroad Commission of Texas. Gulf proposed an amendment which would provide that allowable production be distributed among wells in the field on the basis of a formula involving the product of acres and potential. The Goldsmith field was developed on an allocation formula involving distribution of 50 per cent of the field outlet to acreage and 50 per cent to potential.

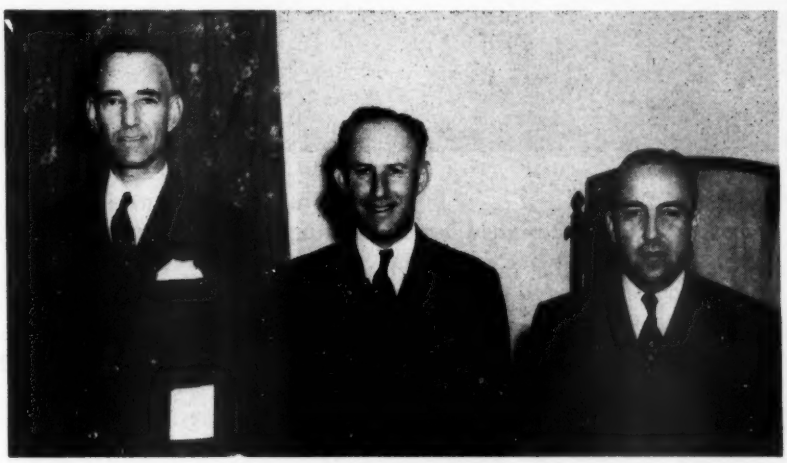
The finding of the commission is that each of the 980 wells in the field "is assigned 20 acres in the determination of the allowable production; that the practical result of the adoption of a rule for this field whereby well allowables would be based on 100 per cent on the product of acres and potential would be to ignore acreage as a factor in this determination and to further reduce the allowable of any prudent operator who has heretofore sacrificed potential to secure efficient well completion and operation."

Petroleum Electric Power Association Discusses Problems

DALLAS, Tex. — The Petroleum Electric Power Association held its fifteenth annual meeting here December 1 and 2 and discussed the innovations in the petroleum industry affecting the electric-utility industry. Also under discussion were the operating problems brought on by war conditions and the postwar situation within and without the industry.

P. M. Cordell, Texas Electric Service Co., Fort Worth, Tex., discussed "Deep Well Drilling With Purchased Electric Service" and outlined the various types of rotary rigs used in this work and their consumption of electric current. W. H. Stueve, Oklahoma Gas & Electric Co., talked on the use of electrically driven pumping equipment on the big-inch lines. "Petroleum Byproducts, Present and Future" was the title of a paper by E. L. Robinson, Gulf States Utilities Co., and R. S. Mauney, Southwestern Public Service Co.

The new president of the organization is P. M. Cordell; vice president is Lewis B. Blalock, Texas Power & Light Co., Dallas, and secretary is H. C. Levois, Gulf States Utilities Co., Beaumont and Corpus Christi, Tex. Retiring president is K. K. Kreamer, Houston Lighting & Power Co., Houston, Tex.



P. M. Cordell, Texas Electric Service Co., Fort Worth, Tex., new president of the Petroleum Electric Power Association; E. L. Robinson, Gulf States Utilities Co., Beaumont, Tex., who presented a paper on petroleum byproducts, and K. K. Kreamer, Houston Lighting & Power Co., Houston, Tex., retiring president of the organization

Aviation-Gasoline Output Quadrupled by Texas Co.

SAN FRANCISCO Calif.—Production of 100-octane aviation gasoline at its West Coast plants has been quadrupled since Pearl Harbor, Texas Co. reports. A new plant in southern California scheduled for operation next summer will double the current 300 per cent increase.

Louisiana Hearing

The Louisiana state-wide proration hearing has been set for December 16 at the Monteleone Hotel, New Orleans, at 10 a.m. The Conservation Department will hear evidence for setting up allowables for January and February.

(Off. Photo U. S. N.)

The Navy Torpedo Bomber gets results by using a depth-charge specially designed for "scratching subs." It's the same with oil-well cementing—the Oil Man gets results by selecting the cement that is specially designed for the job in hand. Four great Lone Star Cements to choose from . . . let job conditions decide which Cement to use:

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Mexico's Production Continues Upward

UPWARD trend of crude-oil production in Mexico continued in September and October. Daily average output of 110,299 bbl. from operations of Petroleos Mexicanos, government oil agency, was the highest rate attained since February 1942. September production of 105,726 bbl. daily also constituted a new peak for the previous 18 months.

The most important increases are reported in the North Tampico district which produced at the daily average rate of 19,293 bbl. in October compared to 1,500 to 2,000 bbl. a day during the low point of operations earlier this year.

Production from Poza Rica, Mexico's most prolific field, rose to a rate of 57,377 bbl. daily in October compared to 56,495 bbl. in September. Poza Rica production, however, is comparatively steady.

The sharp increase in production from the North Tampico fields reflects the resumption of exports of fuel-bearing crude, an operation that came to a virtual halt when the submarine menace was at its peak during the second quarter of this year.

Monthly Production, 1943

Month	Total	Daily average
January	2,312,896	74,609
February	2,179,499	77,839
March	2,727,157	87,973
April	2,653,947	88,465
May	2,686,718	86,668
June	2,643,757	88,125
July	3,102,002	100,065
August	3,145,605	101,471
September	3,171,795	105,726
October	3,419,269	110,299
Ten months	28,042,645	92,245

Monthly Production, 1942

January	4,242,127	136,843
February	3,878,810	138,530
March	3,241,539	104,566
April	2,702,744	90,091
May	3,066,067	98,905
June	3,124,532	104,151
July	2,792,471	90,079
August	2,399,704	77,410
September	2,131,134	71,038
October	2,102,414	67,820
November	2,089,638	69,655
December	2,207,620	71,213
Year's average	33,978,800	93,093

Government Use of Texas Gasoline Sets New Peak

AUSTIN, Texas.—Sales of tax-free gasoline to United States government agencies in Texas reached a new peak in October of 167,250,507 gal., it was reported here this week by George Sheppard, state comptroller. October sales to the U. S. agencies compares with 145,263,442 gal. of tax-free gasoline distributed to the same consumers in September and with a comparatively scant 39,586,980 gal. in October 1942.

Taxes were paid on 102,641,255 gal., to other purchasers, a 1 per cent increase over 101,616,354 gal. in September, and a decline of more than 10 per cent from 114,636,596 gal. distributed to the same sources a year earlier.

The October figures show that 62 per cent of all Texas gasoline sales are to U. S. agencies.

Pure Posts New Prices for Crude in Blanconia Field

Pure Oil Co. has posted a new schedule of prices for oil in the Blanconia field, Bee County, Texas, effective December 1, 1943. The prices range from $1.06 for 20-20.9 gravity to $1.48 for 40 gravity. Until further notice a trucking charge of 10 cents a barrel will be deducted.

Corrosion Engineers

HOUSTON, Tex.—A new organization, National Association of Corrosion Engineers is being formed at Houston, Tex., under the guidance of R. A. Brannon, Humble Pipe Line Co., and O. C. Mudd of the Shell Pipe Line Corp.

While the name is new, the membership is composed largely of the group that previously carried on activities in the cathodic section of the Petroleum Industry Electrical Association.

Formation of the new organization will permit all persons engaged in the work of corrosion control or mitigation on underground metallic structures to participate as members.

First annual meeting of the new organization is to be held April 10, 11 and 12, 1944, at the Rice Hotel, Houston, Tex. All members and applicants for membership are invited to attend this meeting.

DEATHS

E. V. Parsons, once active as a wildcat operator and contractor in the Duncan area of Stephens County, Oklahoma, died last week in Artesia, N. M.

Frank G. Hatfield, 72, retired oilfield worker, died recently in Bradford, Pa., where he had resided 50 years.

James E. Forrest, 62, at one time manager of the old Pierce Oil Co., died last week at his home in Dallas, Tex. He was a graduate of the University of Michigan law school and practiced law in Dallas, but abandoned that profession to enter business.

David Daube, 72, partner of his brother, Sam Daube, in oil-production and ranching enterprises in Oklahoma and Texas, died last week in Ardmore, Okla.

Allen L. Duncan, 39, formerly a clerk in the accounting department of Gulf Oil Corp., Tulsa, died last week at his home in that city.

William D. Swafford, a worker in the Carmi oil field, White County, Illinois, died last week of injuries suffered in an oil-tank explosion.

Robert S. Hoffman, a carpenter employed by Sinclair Refining Co. 23 years, died November 29 in Houston, Tex.

August F. Dahme, 61, South Texas oil man, died last week at his home in Yorktown, Tex.

Henry W. Smith, 69, for 25 years an attorney for Oklahoma Natural Gas Co., Tulsa, died last Friday.

Frank Findlay, 79, oil-well driller, died last week in his home in Rockland, Pa.

John William Hector Wells, 38, field superintendent for Lion Oils, in Turner Valley, Alberta, for 2 years, died recently. A native of Port Hope, Ont., he had been connected with various Turner Valley oil enterprises since 1923.

Joseph T. Ellis, former manager of Steel Boiler and Oil Heating Division of National Radiator Co., Johnstown, Pa., died November 19. He had been with the company for 30 years.

Lt. Larry N. Succop, son of Clarence F. Succop, president of American Roller Bearing Co., was killed in action October 17 in the New Guinea area while flying a fighter plane with the Fifth Air Force. Lieutenant Succop enlisted in March 1941 and had been on active combat duty for 13 months in the Pacific campaign. He was decorated five times. In civil life he was sales representative of American Roller Bearing Co. in the Southwest.

David Mills Hammett, 59, vice president of Axelson Manufacturing Co., died November 30 at his home in Whittier, Calif. Death came as a result of complications from pneumonia, followed by a heart attack. Mr. Hammett joined Axelson in 1922 as salesman. In 1927 he was made Mid-Continent sales manager and in 1933 was elected vice president.

Everette J. Warnell, 60, for 25 years chief clerk in the purchasing department of Humble Oil & Refining Co., Houston, Tex., died at his home in that city December 4.

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DALLAS, TEXAS

Reducing Rotary Drilling Hazards In Rocky Mountain Operations

by Neil Williams

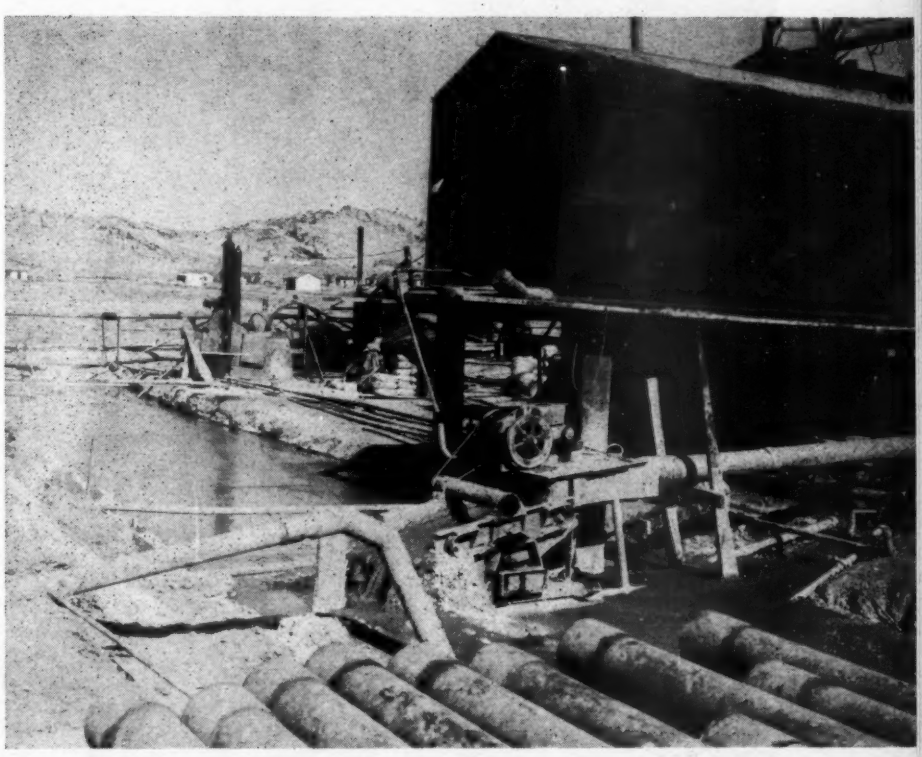
The technique being followed to make possible more effective drilling of the hard and steeply dipping formations in the Rocky Mountain area is discussed in this article, the fifth of a series dealing with operations and development in that district.

HARD, abrasive, and steeply dipping formations have created many problems for rotary drilling in the Rocky Mountain area. In general, these problems have to do with excessive wear on bits, tool joints, and drill pipe; slow drilling, and the hazards of crooked hole, sticking of drill pipe, and twistoffs. All are closely interrelated, and combine to contribute to the exceptionally high drilling costs which characterize operations in this area.

Rock bits are necessary for all drilling in the area, and formations are so hard that few wells going to depths of 4,000 to 5,000 ft. can get along with fewer than 50 to 60 bits. In many wells the number is much greater than that. Bit footage often is measured in inches rather than feet. Typical of this was a section of 100 ft. in a recent well in which 100 bits were required, an average of 1 per foot. Another recent well drilled to 9,200 ft. used more than 400 bits.

Cost of the bits themselves is a major item of well expense. However, more important is the loss of drilling time by numerous trips to change bits and inability to keep bits on bottom for longer periods. Also, as the bits wear while on bottom and effectiveness of the bits is reduced, drilling is slowed up while trying to get as much footage as possible from the bits. Weighing the cost of retarded drilling with a worn bit against the cost of coming out of the hole for a new bit is a factor in holding drilling costs to a minimum.

To make the most hole possible, increasing importance is being attached to running types of bits specially designed and most adaptable for the particular formation to be drilled. It is not always possible to know in advance the most effective type of bit to run for any certain formation, but sometimes savings can be made by coming out of the hole and running another bit when the type of bit in the hole is not doing the job. Also, operators and contractors have been cooperative in exchanging information on bit service for different formations within local areas in which they are drilling, and this has helped mutually in determining which types of bits to use or not to use at the proper time. A particular handicap currently, however, is that the most adaptable type of bit for a



Mud system with shale shaker hookup on typical Rocky Mountain drilling rig. Pump suction at far end

certain formation is not always readily available at the time needed. Many times, drillers have to run whatever bits they can get.

Pump pressure also has been found an important factor in getting additional bit footage in many cases. By varying this according to circumstances, rates of drilling sometimes can be increased. Most Rocky Mountain rigs do not have large pump capacity, which prevents wide variations. Pressure capacities range from about 250 to 500 lb.

Rates of drilling have been closely associated with efforts to maintain straight holes. The combination of very hard formations and steep dips, often as much as 45°, has been particularly conducive to deflection of holes, prevention of which has necessitated special attention to control of weight on the bit and speed of the rotary. With too much weight on the bit, the hole will be deflected. In turn, if not sufficient weight is applied little or no footage will be made, and drilling time increased.

The problem resolves itself into a matter of establishing a balance in bit weight that will prevent deflection of the bit and at the same time permit making hole. The weight which can be applied must be varied frequently, according to the hardness of the formations, the breaks and the dips, and requires constant watch by the driller. Seldom can more than 8 to 10 points be carried on the indicator. Often the bit has to be held up to less than a point, in which case the bit may be just touching bottom, with the effect that the hole is just worn down by the rotation rather than by actual drilling. This results in a substantial increase in drilling time for the hole, but in view of the delays and costs of straightening hole or a fishing job in the event of a twistoff or a stuck string of pipe which might result from a crooked hole, it is considered better and more economical practice than taking a chance of faster drilling.

To facilitate more effective control of bit weights according to varying formation conditions, the practice of making hole-deviation surveys at frequent intervals, usually every 30 ft., has become general. In 30 ft. a hole won't go too far off vertical to be readily corrected. If it is found in the surveys that the hole is drilling straight, additional weight can be applied to speed up drilling. Likewise, if it is found the hole is starting to deflect, the bit can be held up some. This permits carrying at all times the maximum amount of weight possible consistent with good drilling.

Rotary speed is another factor affecting hole deviation although its variation also is governed by other conditions such as the whipping of the drill pipe. Although different operators and contractors have different practices and divergent opinions, high rotary speeds usually are avoided. Usually speeds range from around 90 to about 150 r.p.m in straight drilling.

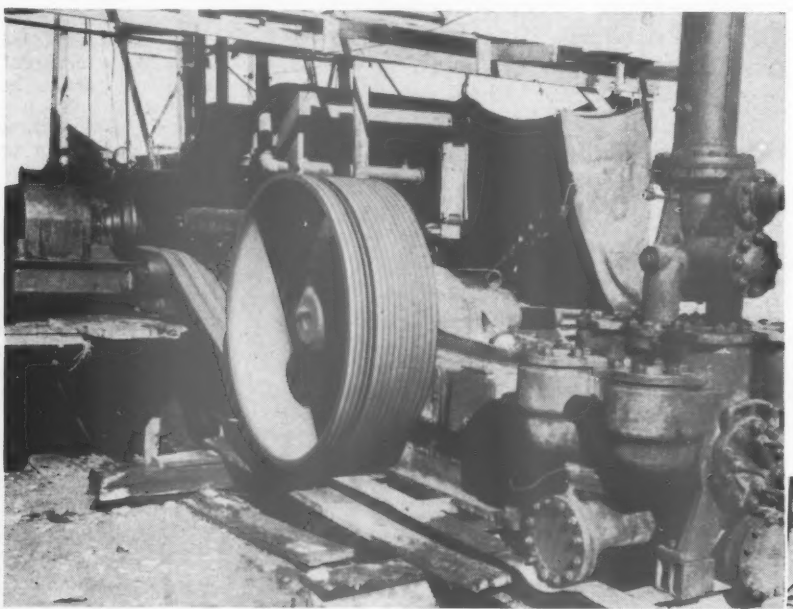
Use of Long Drill Collars

Drilling of straight hole has been facilitated in most operations by the use of comparatively long drill collars. Usually as much as 90 ft. is run on the string. This tends to concentrate the weight on the bottom and prevent flexing at that point.

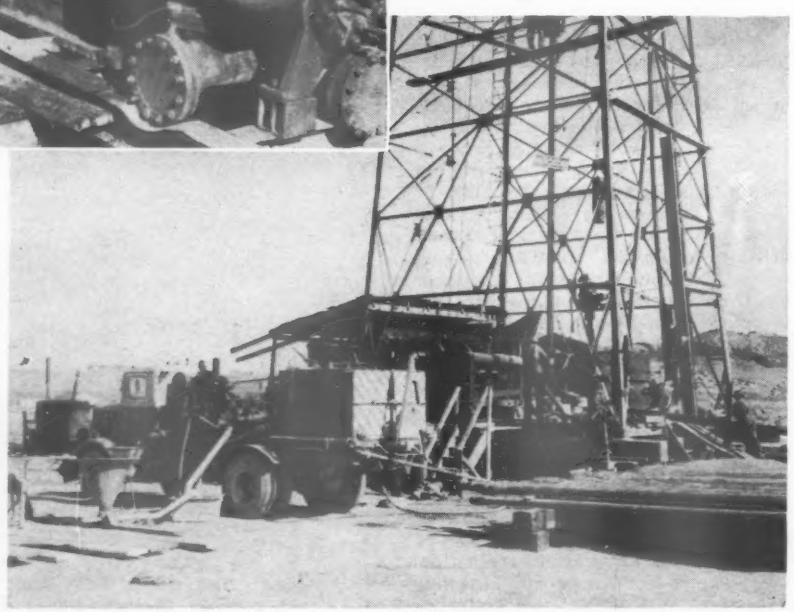
Most drilling contracts in the Rocky Mountain area provide for a maximum hole deviation of from 4° to 5°. However, as a result of practices followed and the control maintained, many of the holes are kept well within that range.

On crests of structures comparatively little trouble is encountered in maintaining straight hole, and fairly good time can be made in drilling. Generally at such locations, wells can be drilled and completed to depths of 4,000 to 5,000 ft. in as few as 30 days. Dips become greater down-structure, however. There, as the dips become greater, increasing trouble is experienced, and often wells to the above depths will require 60 to 90 days in field development and sometimes much longer in wildcats and semiwildcats.

Despite precautions, the hole in some wells will drift a considerable



Left: Single mud-pump installation on Rocky Mountain rig with V-belt drive from derrick floor power takeoff



Right: Rocky Mountain drilling rig with separate rotary drive. Preparing to run oil string

distance from vertical before it can be stopped. When this happens it usually is necessary to back up, set a whipstock and redrill the hole, adding substantially to the well cost. In the hard formations of this district it is difficult, if not impossible, to straighten up a hole by drilling control after it has gone off vertical.

Factors in Tool-Joint Wear

Stuck drill pipe and twistoffs are particular hazards of attempting to drill in crooked holes in this area. Deflection usually is sharp, and with the wear of the pipe against the wall of the hole at that point, key seating usually results, preventing pulling the drill collar and bit past that point when coming out of the hole. This often occasions a long, tedious and costly fishing operation. At the same time, rotating of the pipe against the hard, abrasive walls, due to the flexing of the pipe in the crooked hole, causes excessive wear on the pipe, resulting in twistoffs, and consequent fishing jobs.

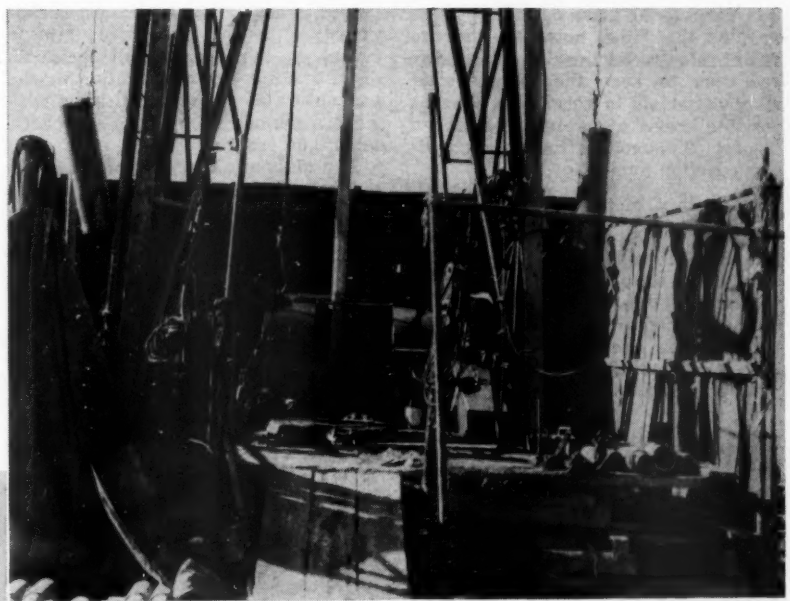
Life of drill strings at best is relatively short. In many instances one string will not drill more than two 4,500-ft. wells without substantial replacements of pipe. This is particularly true of tool joints, which wear rapidly against the hard, abrasive walls of the hole. Several factors enter into this. First, are the off-vertical holes, which tend to cause the pipe to rotate to one side of center against the wall. Drilling of straighter holes has done much to alleviate this as a factor. Second is the carrying of excessive weight on the bit. In this, the weight bends the pipe against the wall, causing it to whip with resultant wear. The practice of carrying only enough weight to make hole has done much to remove this as a factor. Third is the whipping of the pipe caused by rotating at too high speeds, and is being controlled by reducing speeds.

Of particular significance is the fact that in most instances the wear on tool joints and pipe is only on one side, usually about a third of the diameter. So far no satisfactory explanation has been made of this peculiarity. Life of tool joints and pipe strings is being greatly prolonged by modern developments in rebuilding of tool joints.

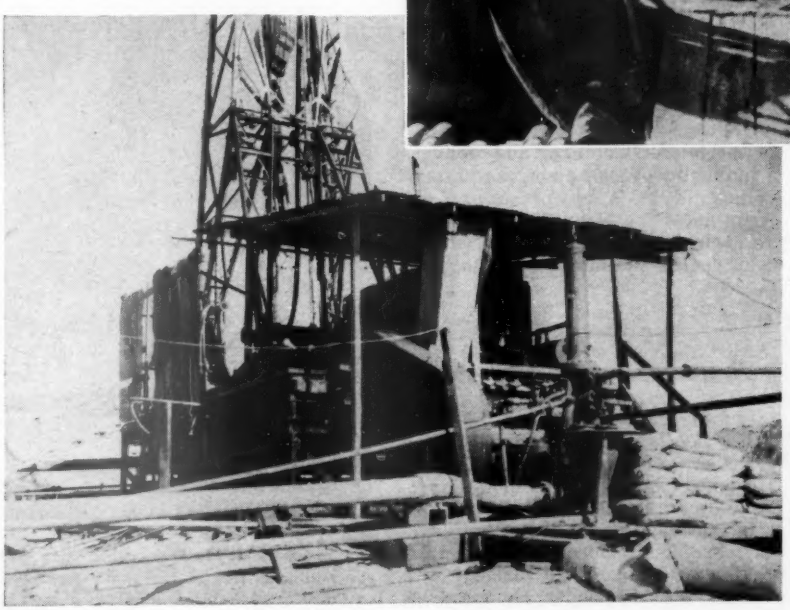
Additional drilling problems have been created in many places by loss of circulation. Particular trouble has been experienced from this cause in passing up the upper sands in drilling to the deeper horizons. Common practice is to eliminate use of intermediate casing strings, which leaves the upper sands exposed while drilling below the surface pipe. The upper sands generally are fairly porous and frequently take the drilling fluid readily unless precautions are exercised. There also are fractured sections in other formations below these sands in which returns may be lost. With loss of circulation the hazard of stuck drill pipe and possible fishing job is presented.

While drilling these porous sands and fractured sections the mud system usually must be loaded with considerable quantities of formation-sealing materials, and quite a bit of Aquagel may be required to raise the viscosity and decrease the filtering properties of the mud. Occasionally it is necessary to place cement and otherwise plug the troublesome formation to stop the loss. When the location of the formation taking the returns is not known, additional trouble can be experienced in locating it.

Introduced about 10 to 12 years ago, rotary drilling has become practically universal throughout the district. Use of cable tools now is largely confined to such shallow areas as Cut Bank and Kevin-Sunburst in Montana. Due to scarcity of good water in many places, equipment consists principally of mechanical or electric rigs, although some steam rigs are now in operation. Medium-sized rigs capable of drilling to depths of around 6,000 ft. have proved adequate in most instances. The nature of the hazards has made unnecessary employment of much special equipment. Only in a few areas have high gas pressures been involved.



Right: Drilling floor on one of the larger mast-type derrick rigs in Oregon Basin field, Wyoming



Left: Mast-type derrick rig in Elk Basin field, Wyoming, showing mud-pump drive and long suction line

Magnaflux Method of Inspection Efficient Means of Determining Defects in Steel

by H. F. Simons and E. H. Short, Jr.

THE compulsory use of substitute alloy steels in both drilling and production operations, instead of the prewar alloy steels of proven merit, demands thorough and frequent inspection of equipment in order to minimize the possibility of failure and the attendant loss of auxiliary equipment and manpower hours of labor.

Heretofore, visual inspection of many types of materials, plus the consideration of service-record data, was considered good operating practice. At this time, however, the use of new steels and the desire of many operators to keep the older, better alloy materials in service as long as possible, have made it necessary to employ the most efficient methods of inspection available.

Magnaflux Method of Inspection

One of the simplest, as far as test procedure is concerned, and also the most efficient methods for accurately determining defects in steel caused by fatigue, overstress or corrosion is through the use of the Magnaflux inspection methods. While the steel members of almost any type of production or drilling equipment may be tested by this method, perhaps the widest use in the oil industry at this time is in connection with drilling equipment. One or two major oil companies on the Gulf Coast have used this method during the past several years for inspecting hooks, drill collars, tool joints, kelly and drill pipe. These companies have now increased the use of this method since the critical material shortage developed, and its use with other companies is becoming more general. Obviously, the discovery of minute cracks in these important members of a drilling rig is essential to the prevention of expensive fishing jobs, since a majority of twistoffs are due to fatigue cracks.

The Magnaflux inspection has been extensively used in war industries to discover hidden defects, for example in airplane parts, where equipment failure may mean loss of life. While the application of this method will be discussed in connection with drilling equipment, the manner of testing will no doubt suggest many other items of equipment to which this inspection method may be applied.

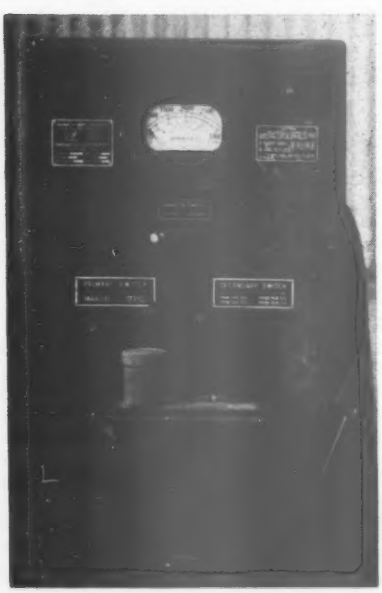


Fig. 1: Magnaflux inspection unit located at Baash-Ross' Houston shop

How Magnaflux Works

In Fig. 1 is a C-403 Magnaflux inspection unit located in the Baash-Ross Tool Houston shop, where a large volume of rotary-testing-equipment work is done for Gulf Coast operators. This particular unit receives its power through cables connected to a 440-volt a.c. line, and delivers a maximum of 3,000 amps. at a no-load voltage of 16. A comprehensive description of the Magnaflux inspection unit must necessarily begin with a brief review of simple magnetic phenomena.

When current is made to flow through one or more coils of an electric conductor wrapped around a piece or section of magnetic material, such as steel, the steel becomes a magnet and will attract and hold particles of steel. There are two types of magnetization employed in the Magnaflux inspection method—longitudinal and circular.

By coiling the conductor into one or more loops, forming a solenoid, as shown in Fig. 2, and placing them around a drill collar, longitudinal magnetization takes place in the collar when current is applied through the conductor. The drill pipe is then surrounded by a magnetic field as shown in Fig. 3.

Circular magnetization, in the case of the drill collar, would be produced by passing the conductor through the drill collar itself and applying current. In this type of magnetization there is no external polarity and only a faint external magnetic field. Circular magnetization of the drill collar may also be accomplished by traversing it by a longitudinal electric current. Fig. 4 shows the magnetic field set up in the drill collar by circular magnetization.

The Magnaflux method employs the use of either a dry magnetic powder or an oil suspension of a magnetic paste as a means of marking defects

Fig. 2: Jimmy D. Gardner, subforeman and engineer in charge of Magnaflux inspection at Baash-Ross' Houston shop

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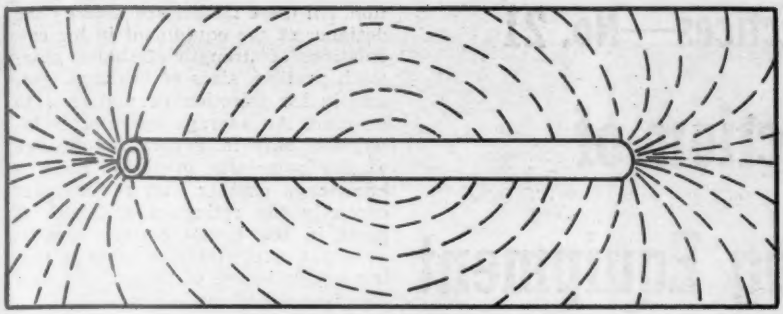

Fig. 3: Longitudinal magnetization. Diagram of magnetic field surrounding magnetized drill collar

in materials. In the case of drilling equipment, such as drill collars, drill stem, kelly, etc., a dry powder is sprinkled from a shaker on the section to be examined. It may be put on either before the current is applied if the surface is such that it will retain the powder or if not, after the current has been applied. When the inspection involves a search for transverse defects, the powder is sprinkled on the section under examination and a high amperage current passed through the coil. As shown in Fig. 5, a longitudinal magnetic field exists; therefore a North Pole is set up on one side of the crack and a South Pole on the other side. The magnetic particles of powder are attracted and held by the leakage produced in the field through the existence of a crack. A light blast of air removes all powder not held by leakage in the field, leaving a fine line of powder as an indicator of surface or subsurface defects. Longitudinal cracks, as shown in Fig. 6, are found through circular magnetization. The magnetic mechanics involved in locating longitudinal cracks by circular magnetization is the same as just described for longitudinal magnetization. The procedure is also identical.

Permanent records are often made which are exact duplications of the defects. These are made by pressing black gummed tape over the indicating line of powder. The line is then protected by placing a string of transparent gummed tape over it.

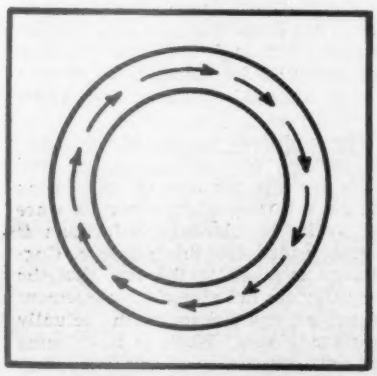

Fig. 4: Circular magnetization of drill collar. Arrows indicate magnetic field

Application to Drilling Equipment

In the present emergency, operators are temporarily cut off from the usual grade of steel used in drill pipe, tool joints, drill collars, etc., and consequently the care of the equipment on hand (made up before the alloy limitation) has become extremely important. Many operators fear that NE (National Emergency) steels will not withstand service in the hole and therefore feel that all reasonable precaution must be taken to spot the material which might fail so that it may be taken out of service. In this connection, the use of the Magnaflux method is becoming rather widespread.

The critical material shortage has brought about a change in the method formerly employed in the handling of drill collars. In the past it was customary to turn worn drill collars down to the next size, cut off the ends and rethread. This would result in a step-by-step reduction in both diameter and length until it could only be used in the making of subs.

Now it is desirable to keep the prewar alloy steel drill collars and other equipment at its original size. This is particularly true of drill collars, since they are needed in drilling the required large-diameter portion of a hole. It is also quite desirable to cut off only a minimum amount each time it is shopped, in order to retain as much length as possible.

The plan that several operators now follow when drill collars are shopped is to have them Magnáfluxed first and then rebuilt. The rebuilding is done by applying successive layers, or beads, of metal by the electric welding method. The built-up section at each end of the drill collar will absorb future wear in the hole and the diameter throughout the remainder of the collar is comparatively unaffected. A reduction of ¼ to ½ in. is considered to be the maximum wear allowed before building up the drill collar.

Most drill collar fractures occur at or near the ends, either in the threaded section or in the adjacent area. A number of breaks, however, also occur at the upper bottleneck end of the drill collar. These failures occur from microscopic cracks which develop at the surface and progress circumferentially and inwardly until failure results. All surface irregularities, however, despite the visual appearance which might mark them as serious enough to produce ultimate fracture, must not be regarded as marks of potential failure. It is the operation of the Magnaflux unit, combined with the judgment of a skillful operator which eliminates a majority of such guess work which was formerly necessary in the inspection of drilling equipment.

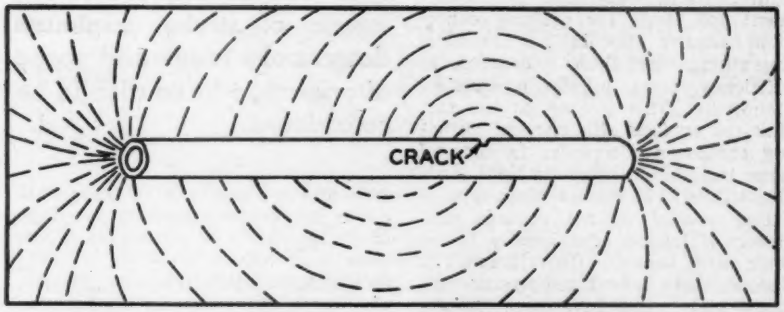

Fig. 5: Magnetic field around transverse crack in drill collar

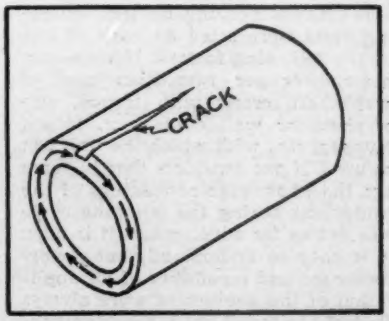

Fig. 6: Magnetic field around longitudinal crack in drill collar

Oil-Well Pumping Practices—No. 21

Factors in Selection of Surface Pumping Equipment

by J. Zaba

The selection of a pumping unit resolves itself into a consideration of several interrelated factors. In addition to the necessity for determining expected peak loads and calculation of peak torque, questions of counterbalance, length of stroke, minimum downstroke loads and speed of operation have also to be considered.

SELECTION of the surface pumping equipment of proper size is a fundamental requirement of efficient and economical operation of the pumping installation. If the selected equipment is too small for loads to be handled, the unavoidable breakdowns will result not only in unnecessary operating expenditures for repairs but they will also cause loss of production during the time the equipment is being repaired. Equipment too large for existing conditions results also in uneconomical operations. First there is decrease in efficiency from purely mechanical standpoint. This is due to the fact that the surface efficiency of pumping equipment decreases in case of large installation handling light loads (Installment 17). Also, certain type of prime movers do not operate efficiently if loaded considerably below their rated capacity (Installment 18). Second, there is required an unnecessarily high initial investment resulting in high depreciation, interest and tax charges.

Two Prerequisites

Two prerequisites of proper selection of surface pumping equipment are: First, reasonably close estimate of loads to be handled; second, application of the equipment of proper rating. It would appear that this second condition should be easily fulfilled. Actually, however, as late as 10 years ago there existed considerable confusion on this subject.[1] Pumping units were rated on basis of any of the following factors: Horsepower, horsepower per revolution, size of crankshaft, crank pull, torque, size of chain or well equipment, tubing plunger, etc., with which the unit can be used. If one considers that 10 years ago the knowledge of loadings of the equipment during the pumping cycle was not as far advanced as it is now, it is easy to understand that opportunity for and possibility of misapplication of the equipment were always present. In many cases the manufacturer secured all data needed for calculation of installation for a given well and on the basis of these data made his recommendation for type of equipment to be purchased. While such a procedure made for a satisfactory installation, it did not furnish, of course, the assurance that the equipment will perform satisfactorily after being transferred to some other well. Need was therefore apparent for simple and uniform standards of rating. Work of different standardization committees of the American Petroleum Institute, in cooperation with users and manufacturers of the pumping equipment, went a long way toward elimination of this confusion. Uniform standards and methods of rating have been established which permit selection of proper equipment once the loads to be handled are determined. This work is being carried on, new findings and new knowledge are being used to improve the methods, formulas and standards recommended.

Selection and rating of surface pumping equipment involves consideration of loads, torque and power. Loads determine the sizes of structural parts of the unit, and through torque they create the size of reducer and transmission. Power requirements affect selection of the prime mover. Such consideration includes, of necessity, the question of counterbalance, length of stroke and speed of operation. All these factors are used by the designer of the equipment in his calculations of strength of shafts, geartooth profiles, sizes of bearings, etc., and in his selection of materials to be used. An average operator is interested only in general knowledge of the principles involved. Such a knowledge enables him to interpret correctly the rating of the unit as given in the manufacturer's specifications. Correct interpretation of rating results in use of proper size unit for given set of conditions.

A.P.I. Standards of Rating

The A.P.I. rating of a pumping unit covers both the rating of pumping structure and the rating of speed reducers. Standards referring to pumping structures[2] prescribe use of a name plate, to be affixed to the A frame or to the sampson post, giving the A.P.I. safe load capacity of the structure. The capacity is that of the weakest element of the surface equipment from beam hanger to the crank. Formulas are given for calculating of permissible loads and allowable unit stresses are prescribed for material being used.

The standards for rating of speed reducers[3,4] prescribe peak torque at given speed and maximum overhung load (the latter applies only to the back-side crank) as standard of rating. The horsepower rating used in the past, has been discontinued since it led to confusion and resulted quite often in overload of reducers. The relation between torque and horsepower may change as result of operating conditions of the unit. Furthermore the energy-storing flywheel of the prime mover permits power peaks which may be injurious to the reducer of the same horsepower rating as the prime mover. The torque is therefore the most satisfactory factor of rating of the reducer.

The formulas given in the specifications assume existence of certain specified conditions, such as proper counterbalancing, absence of torsional vibration, good repair of surface pumping equipment, proper foundations and others. Under these assumptions standards are given for design of gears, housing, shafts and bearings and formulas for calculations of peak torque ratings of gears and roller chain drives.

The standards include also suggested method for computing of well loads for the purpose of calculating the peak torque when other data are not available. Slonneger's formula is recommended for this purpose. Cognizance is given to the fact that the formula does not give close agreement under all conditions, with actually measured loads. Work is now being done on correlation of available data in order to determine if any other of the available well-load formulas should be substituted, but for the time

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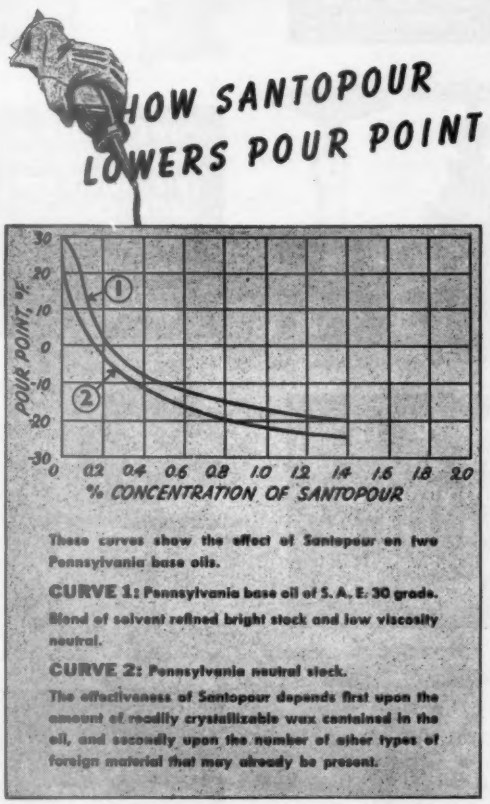

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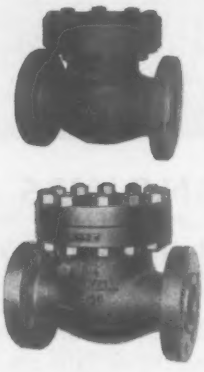

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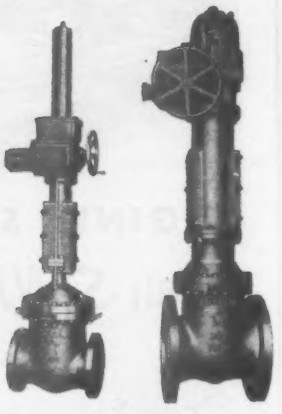

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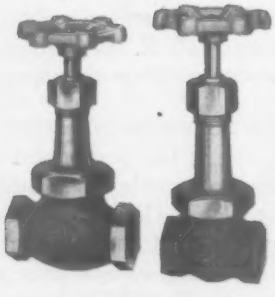

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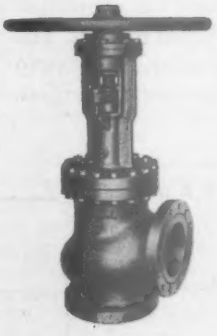

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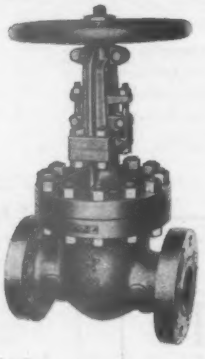

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being, as in the past, Slonneger's formula is still recommended. This formula, and other well-load formulas were presented in Installment 7 of this series and will not be given here. Denoting by P the peak polished-rod load as calculated from the load formula, the A.P.I. specifications recommend the following method for arriving at the resulting peak torque to be used for rating of reducer:

$$\left.\begin{array}{l} NL = 0.4\,P \\ \text{or} \\ NL = P - CB \end{array}\right\} \text{whichever is larger}$$

where

NL = net peak polished-rod load, lb.
CB = actual effective counterbalance force, lb.

After the net peak polished-rod load is determined, the peak torque is arrived at from the formula:

$$T = NL \times \frac{S}{2}$$

where

T = peak torque, inch-pounds
S = polished-rod stroke, inches.

Factors Affecting Selection

The pumping structure capacity of a unit is the upper limit to which the unit can be loaded. It is important, however, to realize that this capacity does not necessarily denote the capacity of the unit. To bring out the interrelation between pumping structure capacity and torque capacity of the unit, the following consideration can be used:[5]

Once the allowable peak torque has been determined from the net peak polished-rod load, and once the reducer of corresponding capacity has been selected the capacity of this reducer determines definitely the allowable well loading of the unit for given lengths of stroke and for given counterbalance. Such an allowable well loading consists of counterbalance capacity of the unit and the net well load. From the above given equation for peak torque and from previous discussions of this subject it is apparent that for a given value of torque the value of allowable net peak polished rod decreases with increase in stroke. Conditions easily can arise under which for certain length of stroke the allowable net peak polished rod, as determined by the reducer, is below the pumping structure capacity of the unit and becomes a governing factor of the capacity of the unit. This statement can be best illustrated by an example.

Lets assume a unit with an A.P.I. peak torque rating of 118,000 inch-pounds, pumping structure rating of 16,000 lb., counterbalance capacity of 9,600 lb. and range of strokes of 25, 32 and 40 in. The above given formula for peak torque can be written:

$$NL = \frac{2T}{S}$$

Where NL would represent the allowable net peak polished-rod load for the given reducer and for the given stroke. Substituting 118,000 for T and three ranges of strokes for S, the values of NL would be 9,440, 7,375 and 5,900 lb. for 25, 32 and 40-in. strokes, respectively. Since the allowable well load consists of counterbalance load plus the allowable net well load the allowable well load with maximum counterbalance would be as follows: For 25-in. stroke, 19,040 lb.; for 32-in. stroke, 16,975 lb.; for 40-in. stroke, 15,500 lb. In case of 25 and 32-in. stroke the allowable well load as far as reducer is concerned, is above the pumping structure rating of 16,000 lb. The pumping structure rating is therefore the governing factor and the capacity of the unit is 16,000 lb. In case of 40-in. stroke, however, the allowable well load is below the pumping structure capacity; it becomes, therefore, the governing factor of the capacity of the unit. In other words if the unit was selected on basis of its pumping-structure capacity and was used on the 16,000-lb. load it would be overloaded by 500 lb. This is not a high overload. It should be remembered, however, that maximum counterbalance was used in these calculations. With smaller counterbalance the allowable well load would be further lowered and the overload of unit, if rated on structure capacity, would increase correspondingly.

Conservative Estimate Desirable

This last consideration emphasizes the importance of conservative estimates of counterbalance needed. Suppose that the above assumed unit has been selected for a well in which the peak load is expected to be 14,000 lb. and it is planned to use 8,400 lb. effective counterbalance. Under this assumption, any of the available strokes of the unit could be used since in case of 40-in. stroke the expected counterbalance of 8,400 lb. plus the allowable net well load for 40-in. stroke of 5,900 lb. equals the allowable well load of 14,300 lb. which is above the expected peak load of 14,000 lb. Suppose further that after the unit has been installed, it has been found that the estimate of 14,000-lb. peak load was correct but that the satisfactory counterbalance for the existing conditions is only 7,000 lb. Under such conditions the allowable well load for the 40-in. stroke would be 12,900 lb. and the unit if used with 40-in. stroke would be overloaded by 1,100 lb. It can be seen from the above that it would have been safer to assume originally a lower counterbalance and make unit selection on this basis. Then if higher counterbalance was actually required the allowable well load of the unit would be increased accordingly.

It has been already pointed out in Installment 14 of this series that possibilities of overload of the reducer exist both on the upstroke and on the downstroke of the cycle. On the upstroke the net torque is the difference between the upstroke well load and effective counterbalance. On the downstroke the net torque is the difference between effective counterbalance and downstroke well load. With effective counterbalance a constant the downstroke load may become, at its minimum, sufficiently small to cause the net torque larger than that for which the reducer has been designed.

The rating of reducer for medium and high-speed short-stroke units is usually made at 20 s.p.m. and for slow-speed long-stroke units at 9 s.p.m. Under A.P.I. specifications the speed for which the unit is rated must be shown on the name plate. Contemplated changes from rated speed of operation should be investigated from the point of view of the individual installation. In case of beam-balanced wells the fact that the effective counterbalance of beam weights is a function of speed of operation, may have a bearing on the subject.

To summarize the above discussion it can be stated that the question of selection of a pumping unit resolves itself into consideration of several interrelated factors. It is not enough to determine the expected peak loads and to calculate peak torque and to check these factors against the ratings of the unit. Questions of counterbalance, length of stroke, minimum downstroke loads and speed of operation have also to be considered. Furthermore, as pointed out by the A.P.I. specifications, it should be remembered that engine characteristics may under certain conditions, increase the peak torque. If the selected unit is close to the margin of safety, the effect of the prime mover used may become an important factor.

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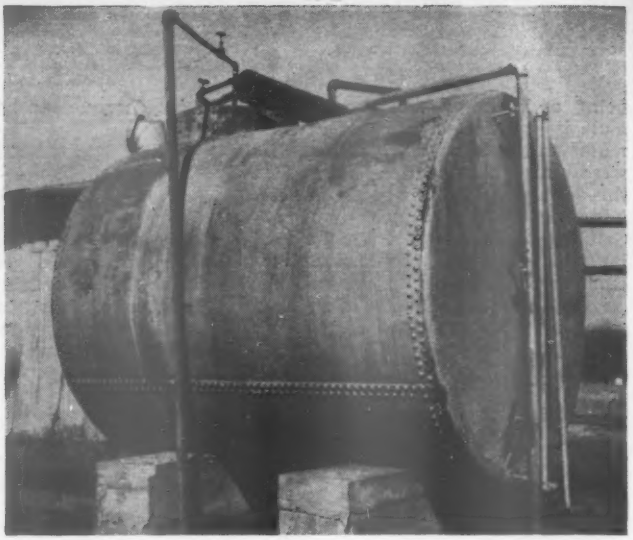
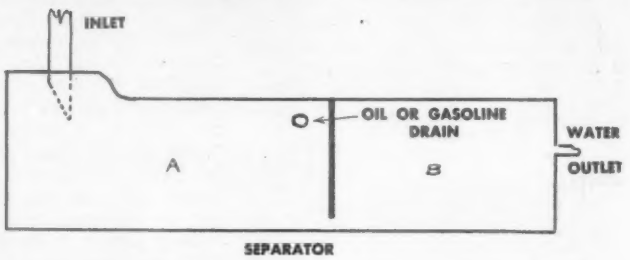
PLANT PRACTICES

Spring Gage Used for Compressor Control Switch

UNABLE to obtain a control switch for the air compressor used in starting the gas-compressor engines, operators of a gasoline plant in Kansas made use of a spring-pressure gage. For this, the face and hand of the gage were removed and a mercury contact was attached to the stem. The control starts the air compressors at approximately 125 lb. pressure and cut it out at 245 lb. pressure. The switch operates the control circuit and the line contactor of an automatic starter.

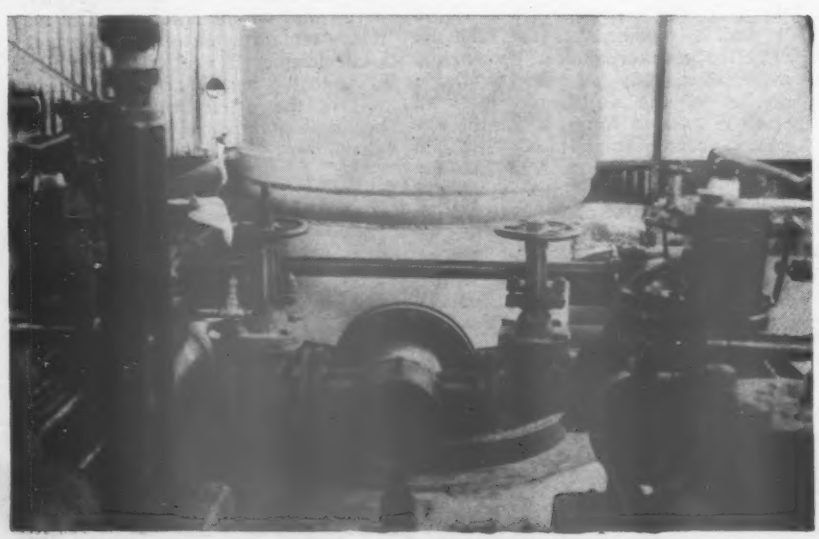




SEPARATOR

Separator Look Box

AT gasoline plants large quantities of low-pressure agitation steam is injected into the still and passes through the condensers to the make tank where it is trapped out at the water leg. This water is practically free of all minerals and is usually trapped into the cooling tower. The device shown is used at one plant where the water (almost distilled) is piped from the trap. It consists of a small horizontal tank carrying a baffle in the center; a portion of the top is cut away so that its contents are easily observed. Should any gasoline be trapped it can be seen in compartment A as the baffle does not extend to the bottom of the tank which permits only water to pass into compartment B. Both the drain in A and the top of the baffle are higher than the discharge connection. Water discharges into the hot well and thus this ideally soft water is saved for the boilers. This arrangement could be used to separate the cylinder oil from condensed exhaust steam from pumps.



Close-Coupled Suction Manifold

SOME of the source of gas lock when pumping natural gasoline or casinghead can be eliminated when the suction of the reflux or suction pumps is placed within a foot or two of the accumulator tank. The accompanying picture shows a close-coupled suction with the pumps in the transfer room The accumulator drum has a large pipe flanged outlet in the center inside the skirt which is equipped with a large companion flange carrying the pump suction connections. These short nipples are attached to the upper side (above center) of the manifold so that small quantities of water may be drained through a small bleeder valve in the extreme lower side.

The Texas Company's policy of many years' standing is to make its patents and inventions available to the petroleum industry at prices that are reasonable.

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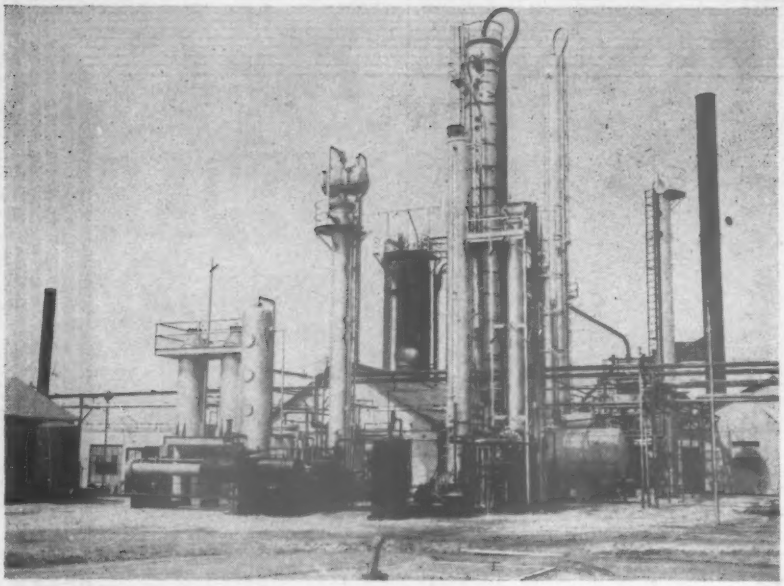


Fig. 1: View of revamped polymerization unit of Bareco Refining Co., used to produce codimer from cracked gases

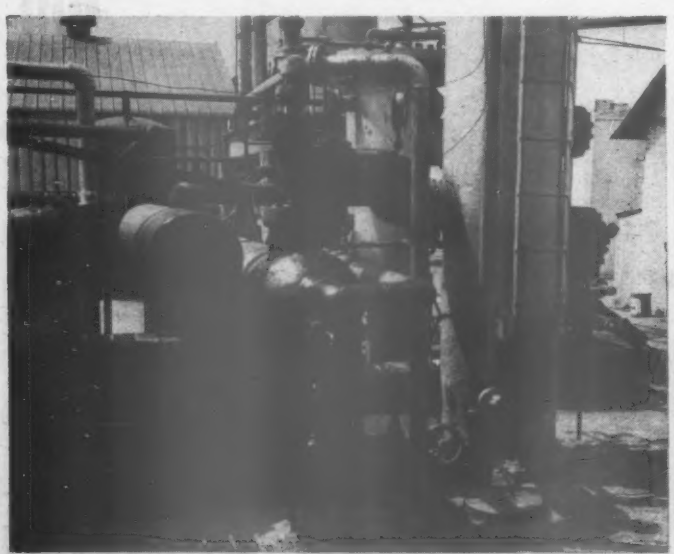
More than 96 per cent of C olefins in cracked gases from Bareco's cracking unit is polymerized to produce codimer — isooctene — which shows 91 octane number. Sulfur, mainly mercaptans, up to 0.25-0.30 per cent, is reduced to permissible percentages by an automatically controlled caustic scrubber.

Bareco Runs Codimer Unit By Remote Control

TRANSFORMING its nonselective polymerization unit into a selective codimer operation, Bareco Refining Co., at Wichita, Kans., is, as usual, handling the operation by remote control, with one small-to-smaller gas flame as the only primary heating unit in the entire plant.

The unit is, or was, a conventional U.O.P. phosphoric acid polymerization unit, operating on run-of-mine gases from the pressure distillate stabilizer overhead. Converted to selective codimer operation, it is now handling selected hydrocarbons.

The overhead vapors from the pressure distillate stabilizer are compressed to 275 lb. gage and are introduced into the polymerizer charge stabilizer tower. These gases contain from 36 to 41 per cent olefins and 4 to 6 per cent of isoparaffins as typical average composition ranges. The stabilizer tower removes the C_5s and lighter (propane, propene, ethane, ethylene, methane, hydrogen, etc.); tower top temperature is maintained at 116° F., while the bottoms are stripped at 225-7° F. The original stabilizer-reboiler assembly proved to be inadequate to strip these bottoms properly; therefore a second drum, of 10-in. pipe fitted with heater coils, was attached in parallel to the regular reboiler to strip the bottoms more efficiently. From the reboiler draw-off the bottoms—polymerizer charge—pass to a caustic mixer-washer equipped with a baffle or two, and the charge washed with very diluate caustic at 160°-180° F. After settling out stray caustic in a settling drum the washed charge, with most of the removable sulfur eliminated, is pre-



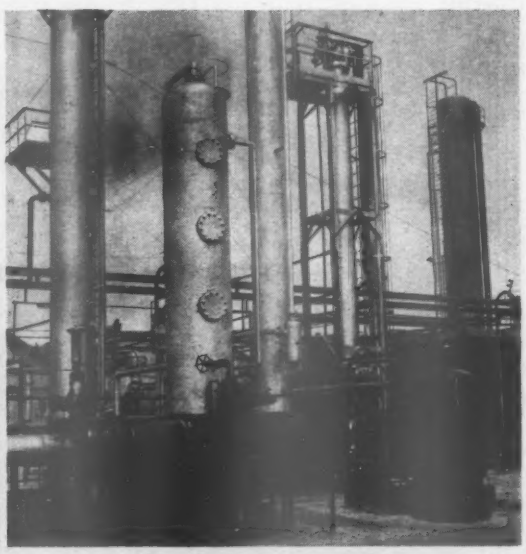


Fig. 2 (left): Double reboiler on stripper column, Bareco codimer unit. Fig. 3 (right): Internal reboiler—horizontal black drum—built into the codimer stabilizer column, from which unreacted olefins are removed overhead from codimer product

Fig. 4 Caustic washer-mixer where corrosive constituents of codimer unit charge are removed with dilute caustic solution

heated to 275° F. and pumped at 500-lb. pressure to the two catalyst chambers, operated in series. To reduce the temperature rise, due to the exothermic polymerization reaction, a middle section of each tower is packed with broken refractory, brick, etc., and into each section so packed cold C_4 streams —butane, butene, etc.—from the overhead of the codimer stripper tower are pumped. By this means the exit temperature of the codimer and unreacted C_3s is maintained at 310° F. maximum. The stabilized charge is generally concentrated to 50-51 per cent olefins, and as high as 17 per cent isoparaffins.

The raw codimer stream is led to a stripper column or stabilizer, shown in Fig. 1, and is reduced to 4 lb. vapor pressure by heat exchange—stripping—with a recycle gas-oil fraction from the cracking unit, in a crossdrum stripper in which the hot gas-oil passes through the tubes which are surrounded by the codimer, the vaporized light material passing up the tower, codimer is knocked back and reflux is drawn from the overhead accumulator of the same tower. Quench oil is drawn from this accumulator and pumped into the packed quench section of the catalyst chambers as outlined above. This tower is operated at 370°-380° F. bottoms temperature, and 150° F. overhead vapor temperature.

The conversion to codimer in this unit averages about 96.5 per cent of the C_4 olefins charged. The octane number of the stabilized codimer is about 91, varying only slightly from day to day. The sulfur content of the charge into the caustic washer runs from 0.25 to 0.30 per cent, mainly mercaptan sulfur.

The feed stabilizer tower is filled in the lower two-thirds with 45 cu. ft. of Raschig rings 1-in. diameter. The remaining one-third section is filled with 15 cu. ft. of ½-in. rings of similar design.

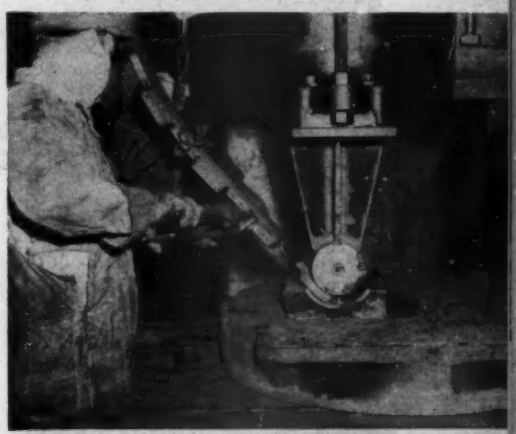
The codimer from the reboiler usually shows from 8 to 16 color on the finished stream which is ready to be shipped. Its color has not been lower than 3 at any time during the operation for codimer polymerization.

The amount of preheater and stripper oil going to the unit is controlled automatically, actuated by the bottoms temperature. Among the various items of interest seen about the unit is the gage glass guard shown in Fig. 4. A section of 2-in. pipe was cut away by a torch on one side to allow it to be slipped over the gage glass which is located in an exposed position on the outer end of the caustic washer drum, and fastened in place with heavy wire, an arrangement which protects the glass from blows and which also allows the guard to be removed instantly when necessary. The heat exchanger shown below the caustic washer in this figure was made up with ells, 2-in. and 3-in. tubing, connecting the outer jackets by welded short tube sections, swaging the jackets down at the end and welding to the inner tubes, with unions inserted by which the inner tubes may be broken and repaired or inspected. Note also in the figure the valve-stem extension and its supporting strip by which the shutoff valve to the washer may be operated without clambering over the heat exchanger below.

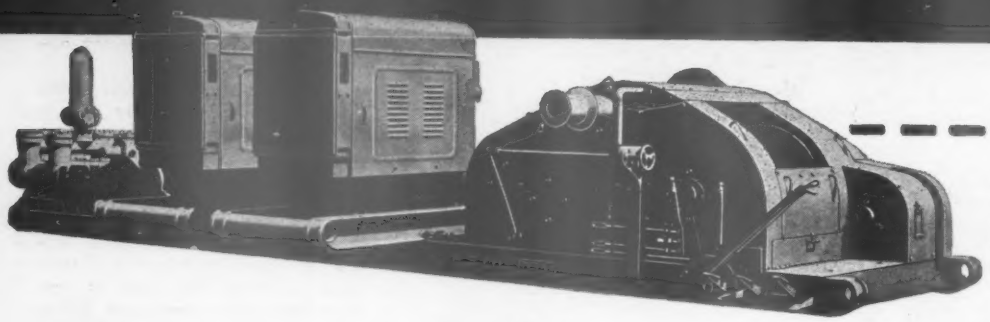
Making Tube Headers

TUBE header parts are cut by the use of templates from such stock as may be available and suitable. These parts are brought in rough shape from the boiler shop and welded together to form the rough header. An inlet and an outlet opening is made by welding in short cylinders or rings which are machined to dimensions. With a horizontal boring mill seven tube inlet holes are drilled in one side and seven plug holes are drilled at the same time directly opposite the tube holes.

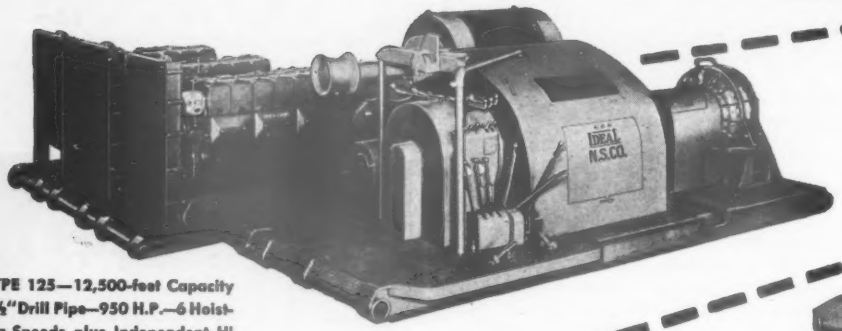
On the holes on one side, into which the tubes are fitted, forming tool is used. Internal grooves are cut forming shear points. The holes opposite are beveled to receive plugs which close the outside face of the header, but permit removal of the plug and inspection of the opposite tube, enable the operator to clean the tube and offer access to the tube in case it is to be repaired or replaced. Tubes are rolled into the headers, forcing some of the outer wall of the tubes into the inner grooves or shear points for a tighter joint and the unit is ready for assembly with others. (Courtesy Gulf Refining Co.)



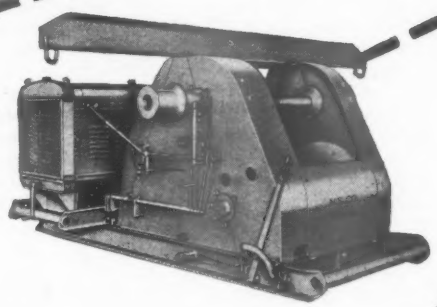
TO FIT EVERY



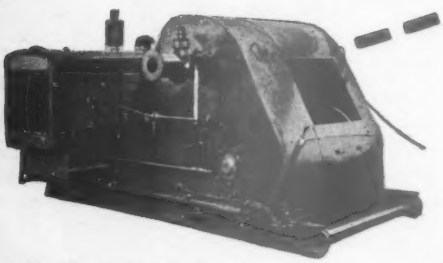
TYPE 50—5000-feet Capacity 4½" Drill Pipe—350 H.P.—6 Hoisting Speeds—3 Rotary Speeds.



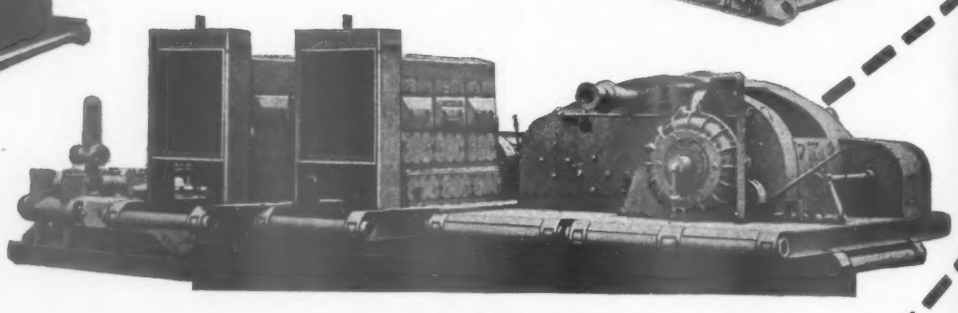
TYPE 125—12,500-feet Capacity 4½" Drill Pipe—950 H.P.—6 Hoisting Speeds plus Independent HI Drive—6 Rotary Speeds.



TYPE 40—4000-feet Capacity 4½" Drill Pipe—150 H.P.—4 Hoisting Speeds—4 Rotary Speeds.

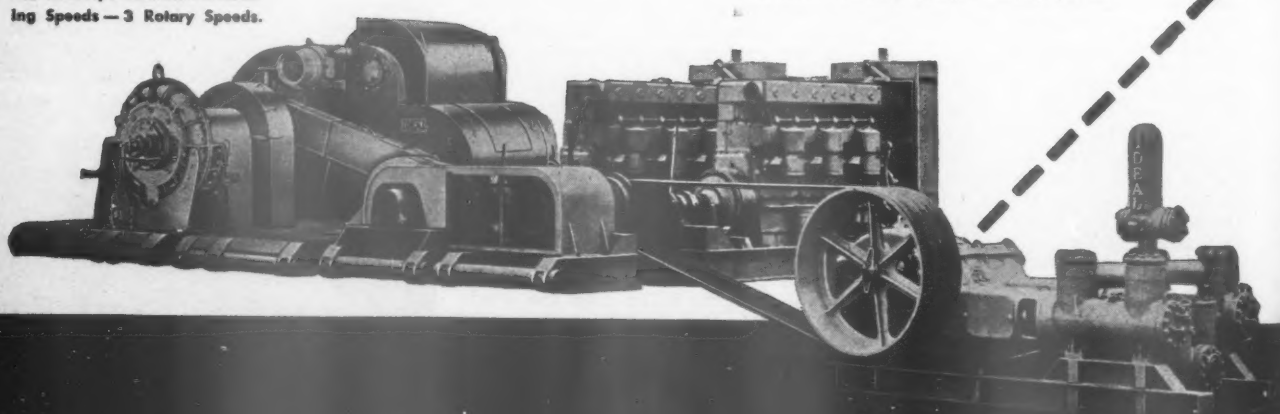


TYPE 30—3000-feet Capacity 3½" Drill Pipe—100 H.P.—4 Hoisting Speeds—4 Rotary Speeds.



TYPE 100—10,000-feet Capacity 4½" Drill Pipe—650 H.P.—6 Hoisting Speeds—3 Rotary Speeds.

TYPE 75—7500-feet Capacity 4½" Drill Pipe—500 H.P.—6 Hoisting Speeds—3 Rotary Speeds.



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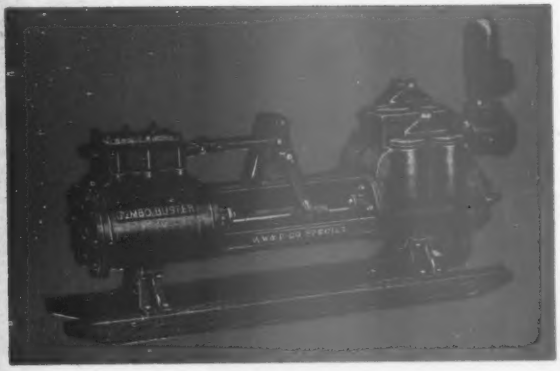
The GUMBO BUSTER K-20



This original 1902 model Gumbo Buster Steam Driven Slush Pump has been succeeded by 41 years of improvements.

NO OTHER STEAM SLUSH PUMP OFFERS SO MUCH, THANKS TO OUR 41 YEARS OF CONTINUOUS IMPROVEMENTS OVER THE ORIGINAL GUMBO BUSTER MODEL.

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We proudly fly this flag . . . Uncle Sam's way of saying "Well Done" to Gumbo Buster.

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This 16" x 8½" x 20" pump has a high test steel fluid end, built for compounding highest pump pressures. The steam end and housing are cast integral. Design of steam end assures greatest steam economy. Fully enclosed oil bath mechanism. No other steam slush pump combines all of the advantageous features offered in this pump.

Other steel fluid end steam slush pumps manufactured by Gumbo Buster include the Type N, 18" x 8½" x 20" . . . Type M, 14½" x 7½" x 18" . . . Type L Boiler Feed, 10" x 4½" x 10".

Bulletin No. 87 gives full details of Type K20. Your new Composite Catalog, off the press soon, describes complete Gumbo Buster line of rotary drilling equipment.

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REFINING

by Arch L. Foster

Aviation Fuels From Cracked Distillates?

NOT yet provided with known and usable sources of straightrun petroleum fractions suitable for aviation fuels as this country has enjoyed, Canada is investigating the feasibility of applying cracked distillate fractions to the fueling of airplane engines. Reports indicate satisfactory results. Canadian military technologists have developed a specification covering fuels from such sources, and they plan to use these fuels at least during the emergency.

This development came as the result of extensive tests on a 900-hp. aircraft engine using cracked fuels made by Canadian refiners. Following block or laboratory tests a series of flight tests extending over a period of 3 months were made. Plans are under way to continue the study in order to determine limits of the plan.

This entire question is too highly technical in nature for any except the fully initiated to venture an unequivocal opinion. Technologists, in fact, will probably be among the last to venture such opinions because they know the potential danger of generalizing on a subject not yet well understood. Gum formation and engine deposits which may militate against the efficient use of strategically essential aircraft have been the main objections in the past to cracked fuels. Olefinic products exhibit strange performances under the extremely severe conditions maintained in an aircraft engine, especially engines in combat service. Di- and other polyolefinic hydrocarbons form gums which clog carburetors, valves and combustion chambers. Consequently aircraft fuel experts have refused to permit the use of cracked distillates in these fuels.

In these stringent times this change may take some of the pressure off newer catalytic cracking and other units, freeing more of their capacity for production of combat fuels. Furthermore, for the future, it seems possible in view of the Canadian findings, that the thermal cracking art may be employed for making commercial plane fuels in the postwar period. Possibly hedgehopping private planes in the postwar regime may be serviced with fuels from the same supplies which take care of the automobile engine, simplifying distribution and supply of these products and so furthering the use of planes by private individuals all over the world.

Additional investigation of this matter is highly desirable and to be encouraged and invited.

Alcohol Strong Competition As Butadiene Source

NO doubt that the alcohol industry is offering the petroleum industry serious competition as a source of butadiene; no doubt that, if the synthetic-rubber industry lives healthily after the war this competition will be accentuated. In which case the only factors which will enable the petroleum industry to win are brains mixed with economics built on topflight technology.

In a pilot plant financed with private funds, without any aid, we understand, from a paternalistic government, in Maryland butadiene is now being made in appreciable—pilot-plant—quantities using as source ethyl alcohol made from waste sulfite liquor. The liquor represents a large production of such material in the United States and Canada, especially the latter, and until a process for making ethyl alcohol from it was developed we understand was practically a complete loss to paper-pulp producers. Reportedly, this pilot plant is continuing its work under the direction of Joseph Bludworth, research chemical engineer, for Celanese Corp. of America.

Ethyl alcohol of 192 proof (96 per cent) is made from waste sulfite liquor from the Chicago Tribune's Canadian paper mills. The alcohol is transported to the Celanese plant near Cumberland, Md., according to the Cumberland Evening Times, and there is dehydrated and dehydrogenated to butadiene. The alcohol, CH_3CH_2OH, is first oxidized (dehydrogenated) to acetaldehyde, CH_3CHO by removing two hydrogen atoms; then two oxygen and two hydrogens are removed, forming C_4H_6, butadiene. Four steps are involved in all, the acetaldehyde-to-butadiene cycle including formation of aldol and next butylene glycol, $CH_3CHOHCH_2CH_2OH$, which is dehydrated to butadiene.

Two interesting facts appear in this development. Paper is likely to be made for a long time to come; sulfite is one of the most economical if not the most economical process for making paper; the liquor containing the rejected, undigested lignin of the wood will continue to be made in the sulfite process. Thus, a byproduct having only nuisance value will probably be available in large quantities, begging disposal; a cheap raw material for the synthesis.

The Refining Industry's War Work—An Unsung Saga

WHEN will the world, and the people of the United States, be told of the tremendous accomplishments of the refining industry—the day-and-night development of technical processes and syntheses of the products without which the war program couldn't even turn a wheel or a propeller? When will the facts be announced and publicized so that John Doe and his family will cease to take the refining industry's almost superhuman task as a matter of course?

The transportation of refined products, the production of crude and the results of use of refined oils have been blazoned abroad, their accomplishments screamed from the housetops, justly, properly and deservedly. These works with a few exceptions are mechanical achievements. Without the alchemy of the refining technologists' processes, crude oil becomes, rather remains a dead and noisome thing, better left underground with the dinosaur's bones. Without chemical synthesis to form the molecules needed to do the war machine's job, crude is no nearer to useful consumption than is a pork ragout in the form of a squealing pig racing over Pennsylvania's hills. Crude petroleum never took a Fortress "upstairs like a home-sick angel" to blast the Jerries into the North Sea or scatter Itali-Fascists over the sacred Mediterranean. Plenty face lifting must be done before the crude can do its most vital job in the war; the refinery is the beauty shop, the refining engineer the operator which together get this "plastic surgery" job done.

Secrecy has until now, and still is, keeping the black curtain drawn securely over most of these nigh-miraculous deeds. The refiners have earned acclaim and credit second to none in this country. It seems high time to lift the lid and show some of the wonders which have been worked, what refiners are doing to win.

QUESTIONS on TECHNOLOGY

by W. L. Nelson

A Perfect Gasoline

We are planning on starting an advertising campaign featuring a perfect gasoline. We have our ideas of such a fuel but we would appreciate your ideas of what such a fuel should be.—P. S. A.

Obviously, no fuel can be perfect; only an approach to perfection can be attained. Also it must be pointed out that a near-perfection fuel will probably cost more than most motorists are willing to pay, and that the requirements of such a fuel will change constantly with each change in automotive engines. Finally, it may be advisable to supply at least two fuels, one for extreme cold or Arctic climates and the other for temperate and hot climates.

Motor-Fuel Performance

The main requirements of a motor fuel are:

1. Noncorrosive in the feed, engine, and exhaust parts of the mechanism. This necessitates the removal of inherently corrosive sulfur compounds as by the sweetening processes, and the elimination of nearly all of the more stable sulfur compounds which after combustion cause corrosion.

2. Be chemically stable during use and storage. This requires primarily a freedom from the so-called gums that are present in gasolines produced by cracking or other thermal processes. Thus, thermalized products cannot be used unless a gum inhibitor is employed.

3. Be physically stable during transportation and use. Physical properties contemplated are the freezing point and the tendency to evaporate or be lost during handling or storage in either bulk or automobile tanks.

4. Have a high heating value. Among materials that are abundant, the petroleum hydrocarbons are superior in this respect.

5. Little tendency to detonate or knock. A hydrocarbon structure which is so clustered about a center, that a high octane number is attained, or such additive materials as tetraethyl lead may suffice.

6. A good susceptibility or reactiveness to such materials as tetraethyl lead. This means a thorough elimination of sulfur.

Perfection with respect to these requirements is so difficult that only an attempt can be made to incorporate all of those properties into a single material. Other requirements or properties which are listed later in this discussion are not so limited and they justify so much discussion that specifications for the first six requirements will be tabulated here. When satisfying the requirements of most vehicles and most climatic conditions, the physical properties should be somewhat as follows:

Test and specification	To insure this performance
(1) Sweet to doctor test	No corrosion of feed line and engine
(2) Sulfur, 0.006 per cent	No exhaust corrosion and a good susceptibility to lead
(3) Gum, 7 mg. (preformed)	No sticking valves
(4) Induction period, 7 hrs.	Storage stability during 10 months
(5) Freezing point, —75° F.	Remains liquid in Arctic climes
(6) Gravity, A.P.I. 70	To give gross heating value of 20,500 B.t.u./lb.
(7) Octane No. (A.S.T.M.) 90	Satisfies about 98 per cent of cars

Obviously, these specifications do not attain perfection, but they are strict enough to satisfy the requirements of nearly all present-day automotive vehicles. At the present time sulfur can be permitted to percentages of 0.1 without much exhaust-line corrosion; gum up to 12 mg. usually gives no trouble with sticking valves; an induction period of 3½ hours will insure freedom from gum during the common storage period of 2 months; a freezing point of —40° F. would care for most climates; a gravity of 55 A.P.I. would lower the heating value to only 20,200, and an octane number of 75 would satisfy the general public.

7. Crankcase loss or failure of fuel to vaporize. This is usually measured by means of the 90 per cent distillation temperature on the A.S.T.M. distillation curve. According to data by Holaday and Happel (Trans. S.A.E. 1942) only about 10 per cent of all automotive engines suffer a crankcase loss of 5 per cent (or less) if the 90 per cent distillation temperatures are as follows:

Operating temperature	90 per cent dist. temperature
—40° F.	*240° F.
0	*315
40	340
85	375

*Estimated.

If all (or 98 per cent) of the cars are to exhibit suitably low crankcase losses, far lower and almost prohibitive 90 per cent points are required.

8. Warmup and acceleration performance. According to Holaday & Happel, a satisfactory performance after 2 to 4 miles of operation, defined as "warmup," is satisfactory to most motorists. This is perhaps the performance property that is most lacking in present-day motor fuels. The above authors conclude by experiment that the minimum percentage boiling at 158° F. should be somewhat as follows. It will be noted that extrapolation of their data was necessary in order to state values for the low temperature of —40° F.

90% point	% vaporized at 158° F. (min.)		
When operating at	40° F.	0° F.	—40° F.
340° F.	18	42	70
315	12	37	68
240	0	24	64

9. East of starting. According to Letter Circular LC-551 of the U. S. Department of Commerce, entitled "Good Gasoline," ease of starting can be judged by the 10 per cent distillation temperature.

10 per cent point	Ease starting temperature
86° F.	*—36° F.
104	—22
122	—9
140	1
158	12
176	23
194	*34

*Estimated by extrapolation.

10. Freedom from vapor lock. The Reid vapor pressures that will cause vapor lock are somewhat as follows:

Operating temperature	R.V.P.
130° F.	*5.0
100	7.25
80	9.6

*Estimated by extrapolation.

A Perfect Gasoline

From the above tabulations of operating temperatures versus distillation characteristics, it appears that a gaso-

(Continued on page 67)

December 7, 1941...

14 HOUDRY UNITS ON STREAM

TWO years ago, when Japan treacherously attacked Pearl Harbor, there were 14 Houdry units in operation and two more nearing completion.

Thus, fortunately for America, the petroleum industry was not caught wholly unprepared for sudden war's huge needs of aviation gasoline. The far-sighted refiners who had adopted the Houdry Catalytic Process in order to produce higher quality motor gasoline, were in a position to convert their facilities quickly for the production of high-octane aviation fuel.

First in Volume

The importance of the contribution which these companies have made to Allied airpower can hardly be overstated. For, during two critical years of war, Houdry licensees have carried almost the entire burden of producing catalytically cracked aviation fuel for the United Nations.

First in Number of Units

27 out of 31 catalytic cracking units now reported in operation are Houdry-licensed units. They operate dependably around the clock and across the calendar. Thirty-two more Houdry and T.C.C. units are under construction.

First in Acceptance

The sixteen companies now operating or building Houdry and T.C.C. units include most of the best known names in the petroleum industry and represent over 50% of the total refining capacity of the United States. Their faith in the post-war future of these processes is strikingly demonstrated by the fact that most of them paid for their new plants out of their own pockets, without government aid.

HOUDRY PROCESS CORPORATION, WILMINGTON, DELAWARE

HOUDRY CATALYTIC PROCESSES ... FOR VICTORY IN WAR ... FOR PROGRESS IN PEACE

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Cracking Technology—No. 10

Today's Cracking Equipment In the Postwar Era

*by C. R. Wagner**

In the concluding article of this series the author gives his views on trends in postwar refining. He says that the average refiner making aviation fuels will require either catalytic cracking or alkylation or both. Motor-fuel performance is improved by the presence of large percentages of olefins in the light fraction; therefore this portion of the fuel of tomorrow may well be made by thermal cracking or equivalent methods. Isoparaffins, naphthenes and aromatics improve performance when present in high percentages in the heavier half of motor fuel; olefins in this heavier fraction are undesirable for both lead susceptibility and road octane rating. These desirable components are obtainable best by catalytic cracking of charge stocks. Therefore a combination of thermal and catalytic cracking appears to be the best prospect for fuel-refining processes of the future. Heavy olefinic fractions may be hydrogenated or combined catalytically or thermally with light (C_3s and C_4s) to form more saturated products.

THE average independent refiner—as well as many another—is today concerned over the question of postwar refining conditions and the usefulness or uselessness of his present cracking equipment. Will octane numbers of motor fuels keep on going up? Will the refiners favored with government-financed alkylation and catalytic-cracking equipment continue to operate so as to produce large quantities of high-octane-number stock for use in motor gasoline when there is no longer a market for all of it in 100-octane-number aviation fuel? Will Washington continue to allocate crude supplies, fix prices and attempt to run the industry, or will there be a return to more or less free enterprise, with an impartial application of existing statutes? To answer these questions would require another Aeneas to seek out and interview the Cumean Sibyl.

There are, however, certain facts which must be apparent to the thoughtful and analytical mind. Although no one can forecast what will happen politically, it should be evident that cold-blooded economics will determine what wartime equipment can be operated postwar. Only the naive can hope for much in the way of tax reduction for a long time to come. Overhead and fixed costs on government-financed plants may be drastically reduced by means of the allowable 20 per cent amortization clause in wartime contracts, but that does not get away from the fact that many of these plants are built to convert fractions of gasoline into higher-octane-number gasoline fractions. Operating costs and losses must be offset by higher prices for the finished product, and the public will eventually pay the bill.

Aside from the advertising advantage of high-octane-number motor gasoline on sale at filling stations, what return can the oil company executive expect from an offering to the public of gasoline with an octane number much higher than the 76-78 gasoline of midsummer 1941? A few people would undoubtedly buy such a product, just as some always buy premium gasoline even though the regular grade functions satisfactorily in their cars. The outstanding fact, however, is that there will be no cars on the road for at least a year or more after the close of hostilities which can make proper use of a gasoline of higher octane number than the 80-82 premium grade sold before the war. A further fact to be kept in mind is that the automobile companies will scarcely gamble on a single line of new cars when they start up operations again. There would be too many headaches in trying to make 3 to 5 million cars per year, all equipped with new and relatively untried engines. A further hindrance to such a program will be the lack of distributing facilities for such a new grade of gasoline, since marketers would need a fourth pump and tank to handle it at service stations. It therefore seems more probable that, barring government interference or an acute shortage of crude supplies, conditions will take up about the same course they were pursuing prior to the war. The rate of increase in motor-fuel octane numbers will probably be accelerated by the existence of these wartime plants capable of making high-octane-number products, with the greater emphasis on increasing the octane number of the premium-grade gasoline. For the average car on the road the bulk of the gasoline will continue to be regular grade and third grade similar to prewar products until such time as the average car contains a high-compression engine capable of using a high-octane-number gasoline. Severe dislocations of refinery operating procedures need not be anticipated on this account.

*Consultant in refining technology.

Individual Problems

Since 1941, however, refiners have not had an opportunity to do much about the obsolescence of their cracking equipment, and many are wondering whether they should scrap their old cracking equipment in favor of a new catalytic unit as soon as materials are again available. Of course each refiner must study and answer his own particular problem, but it is worth noting that the plant containing nothing but a catalytic-cracking unit must have an outlet for large quantities of domestic heating oil at a favorable price level, or else pay a high price in yields and costs for recycling the catalytically-cracked gas oil. Such gas oil can be handled successfully through a conventional noncatalytic cracking unit to make a high-octane-number product. The best arrangement, therefore, is a combination of the two processes, if conditions warrant the high investment cost and relatively high operating cost of the catalytic equipment. It is probable that operation of the wartime catalytic-cracking equipment will develop information leading to decreased investment and operating costs for new plants, but it is difficult to envision development which will make such equipment produce a gallon of gasoline as cheaply as existing noncatalytic equipment. If octane-number levels greatly exceed prewar standards, then catalytic cracking may become a necessity for all refiners, although much can be done by recycling C_3 and C_4 hydrocarbons through cracking oils to raise octane numbers without greatly increasing costs of installation or operation.

A factor which has not been thoroughly evaluated is the effect of chemical composition of the fuel upon engine performance.* Although it is making slow progress, there is a growing conviction that the A.S.T.M.

*Wagner, C. R., Ross, W. B., Henderson, L. M., and Risk, T. H., Proc. Am. Pet. Inst., 22 (III), 70-89, Nov. 7, 1941.

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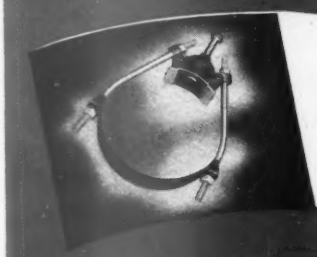

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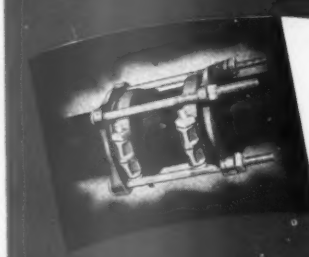

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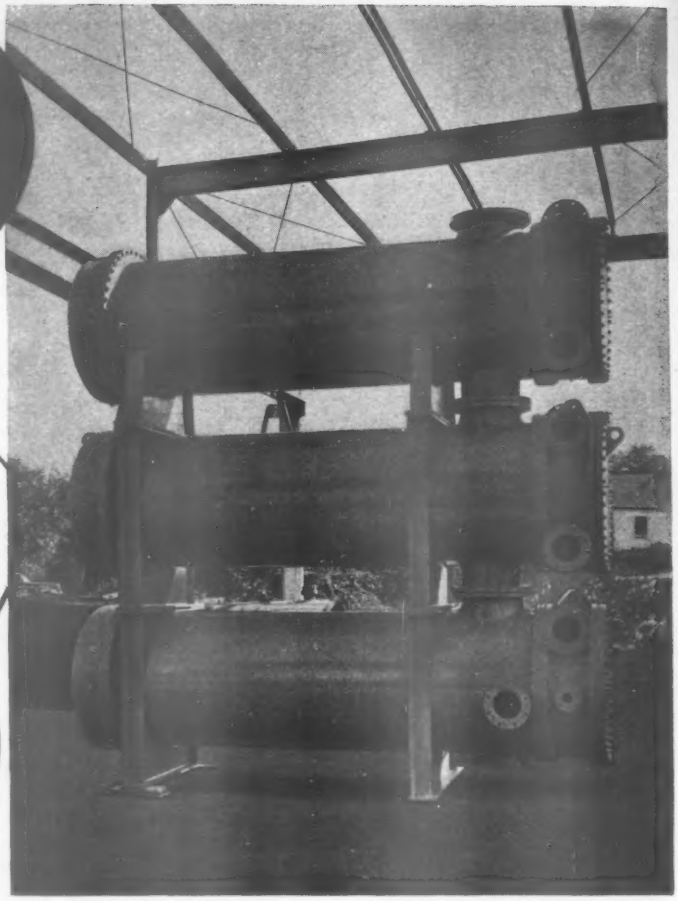

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knock-testing procedure does not necessarily indicate the value of a fuel for a multicylinder engine performing on the road. Practically all engines that have been built into motor cars—and probably most of those which will be built postwar—have different fuel requirements for varying conditions of speed and load. Since it is obviously impossible to carry several different fuels in the car's gasoline tank, the refiner will try to build into his one fuel the properties of as many of these different fuels as he can. It seems worth while to quote a few sentences from the paper referred to above.

"These tests have shown that any fuel containing large portions of olefinic material throughout the boiling range will tend to knock at high engine speeds, and will have relatively poor lead susceptibility not only in the laboratory, but on the road. A highly sensitive fuel, however, in which the high-boiling olefins have been replaced with heavy paraffinic, aromatic, or naphthenic material will show considerably better high-speed performance and considerably better road lead susceptibility. Fuels containing large amounts of paraffinic material in the light-boiling range, in general, will have poor low-speed antiknock performance and poor lead susceptibility at low speeds; but if the low-boiling paraffins are replaced with light olefinic and/or aromatic material, low-speed antiknock performance and low-speed road lead susceptibility usually will be improved."

To produce an ideal fuel, then, we should have a light end such as that made by low-pressure high-temperature cracking and a heavy fraction containing isoparaffins, alkyl aromatics or branched naphthenes (cyclohexene or cyclopentane derivatives). n-Paraffins, except perhaps propane and n-butane, do not make desirable motor-fuel fractions for existing engines. In producing the light fraction of motor fuel, therefore, there does not appear to be any advantage in using catalytic cracking or any of the other equipment constructed for the manufacture of aviation gasoline, rather than the high-temperature noncatalytic equipment already installed or cheaply rebuilt. The product of reforming coils, of gas reversion or polyforming operations, or of high-temperature gas-oil coils when fractionated to about 200° to 250° F. end point produces a fairly satisfactory material. The higher the percentage of olefins in this light cut the better fuel it produces. By lowering coil pressures and fractionating tower pressures the percentage of olefins can be increased, although at the expense of coil throughput and with some loss in yields.

To produce the heavier fraction of the motor fuel catalytic cracking and alkylation has the advantage of directly preparing desirable materials, although the lighter fractions from these operations are less desirable than the light ends from severe thermal cracking operations. One method for securing a suitable material for the heavy ends has not been given adequate consideration, namely, fractionation of straight-run heavy naphtha to isolate the n-paraffins. In most straight-run gasolines more than 50 per cent distills above 250° F. and in general practice this entire cut is sent to a reforming coil. As pointed out in No. 8 of this series, reforming is conducted primarily to destroy n-paraffins, but many other compounds suffer the same fate because they are unavoidably present also. By a precise fractionating operation the n-paraffins from n-octane to n-dodecane could be removed in cuts containing 50 to 70 per cent of the compound in question. These fractions could then be charged to the reforming coil and the remainder of the straight run, consisting of isoparaffins, alkyl aromatics, and naphthenes would make excellent material for gasoline heavy ends.

This leaves for disposition the 250°-400° F. portion of cracked or reformed gasoline which contains relatively large quantities of olefins. To make a satisfactory heavy end for motor gasoline it will be necessary to process this material further, and it is to this problem that the refiner might well devote some research and development effort, since it constitutes over 25 per cent of his total gasoline make. An even greater stake is involved, because there is every reason to believe that it might be possible to raise end points somewhat, if this heavy end of the cracked product can be properly treated. It is assumed that solvent extraction processes are too expensive to install and operate, but this may later prove to be an unwarranted assumption At least three other ways of handling this material appear to be feasible, though investment and operating costs will require careful study to determine which, if any, is possible in each case. One method would be to hydrogenate the olefins, using a catalyst which would not appreciably attack the aromatics. A second method, which would require less new equipment and no particularly new technique, would be to pass this heavy end through a high-pressure coil at high temperature with large quantities of recycled C_3 and C_4 gases. To a considerable extent aromatics would be formed, although not all of the olefins would be destroyed.

A third method would be to pass this olefinic heavy end through a catalytic process to dehydrogenate it to alkyl aromatics. From what has been published to date the Phillips' "Cycloversion process" appears to be such a possibility. Apparently it can be constructed in small as well as large units and it is possible to utilize considerable existing equipment rather than to purchase a complete new installation. If this is correct, then the refiner could convert his heavy cracked material into a desirable gasoline blending stock and would require only such an installation plus fractionating equipment to place him in position to compete with any gasoline that may be offered postwar.

In conclusion it would seem probable that postwar conditions will require much thought and extensive research and development on the part of the average refiner, if he is to stay in business, but that he will be able to continue using his prewar equipment with some modifications and additions. Unless he wants to make aviation gasoline he need not install alkylation equipment, and for a time, at least, he will not need catalytic-cracking equipment to produce a satisfactory grade of motor gasoline.

Editor's note.—The series of 10 articles written for the Journal by this internationally known authority on cracking petroleum is made up of data taken chiefly from the material for a book on petroleum refining, written by Mr. Wagner, which will eventually be published by Reinhold Publishing Co. of New York, as one of the Chemical Monograph Series sponsored by the American Chemical Society.

Questions on Technology

(Continued from page 62)

line which is to operate through a temperature range of —40° F. to 130° F. must have a boiling range as follows, in addition to the seven general specifications enumerated above.

10 per cent maximum, °F.	84
50 per cent maximum	*135
64 per cent maximum	158
90 per cent maximum	240
R.V.P., maximum, lb.	5

*Estimated.

The exceedingly low vapor pressure indicates that it would be necessary to use even lower 50 and 90 per cent points than shown, in order to obtain the low vapor pressure.

For a gasoline that can be used from 0° F. to 110° F. the specifications would be:

10 per cent maximum	140
37 per cent maximum	158
50 per cent maximum	170
90 per cent maximum	315
R.V.P. maximum, lb.	6.8

Again it would seem that a commercial gasoline with a 6.8-lb. vapor pressure would require distillation temperatures lower than the maximum specified, particularly a lower 90 per cent point.

It is obvious that such low-boiling, low-vapor-pressure gasolines would be expensive, and reasons for present practice of manufacturing several grades of gasoline is apparent.

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Branch Stores at All Important Places in the Oil Country

Wartime Fuel Research In Great Britain

by W. C. Schroeder*

THE use of mixtures of coal and oil has been a subject of interest in Great Britain ever since the war of 1914-1918. Most stationary boilers in that country operate on coal and a limited number use tar, but almost none use oil. On the other hand, a considerable proportion of the shipping does use oil, and this is viewed as one of the primary outlets for colloidal fuel.

The liner Scythia of the Cunard Line made a trip about 1932 between New York and Liverpool in which one boiler out of six operated on colloidal fuel. This same liner made another trip about 1940. In both cases the fuel was reported to operate quite successfully, but there seems to have been little effort to use it to any considerable scale.

Powell Duffryn Associated Collieries[1] have carried out the latest and probably the most extensive tests on the preparation and utilization of colloidal fuel. This work has extended over the last 10 or 12 years and has included the operation of a pilot plant to produce about 20 tons of colloidal fuel a day.

The results show that the coal must be substantially free from particles that will not pass a 200-I.M.M. sieve (230 U.S. standard) and that it must be thoroughly wet by the oil and mixed with it. No coal-in-oil suspension was found perfectly stable. The stability decreased with decrease in coal content or fineness and with increasing temperatures. Tests and inspection of tanks and pipe lines have shown that suspensions adequately stable for all normal commercial requirements can be obtained by mixing 40-45 per cent coal, 99 per cent through 200-I.M.M. sieve (230 U.S. standard) with cracked residual oil of the bunker C type. No stabilizing agent or "fixateur" was used. Local overheating during storage must be avoided.

During this investigation, it was found that the coal and oil did not separate into two components after they were once mixed. What actually occurred was a graduation in coal concentration increasing from the top layer to a maximum of about 58 per cent in the bottom layer. Table 1 indicates the time required to attain a concentration of 45 and 58 per cent coal in the bottom layer (one-fifth of the total depth) at various temperatures for a suspension of 40 per cent coal (99 per cent through a 200-I.M.M. sieve) in bunker C oil. The mixed fuel is sufficiently stable for commercial use at ordinary storage temperatures.

Table 1—Effect of Temperature on Increase in Concentration of Coal in Bottom Layer

(60% oil; 40% coal, 99% through 200 I.M.M.)

Temp. C	Time (days) to reach coal concentration in the bottom layer of[a]: 45 per cent	58 per cent
15	More than 150	More than 500
30	Approx. 65-70	Approx. 240
50	Approx. 26	Approx. 85-90
70	Approx. 5	Approx. 17

[a]One-fifth of total depth of mixture.

In the combustion tests the fuel gave no trouble. Mechanical, steam, or air-atomizing burners were used successfully. Difficulty was not experienced with burner stoppages, loss of ignition, pumps, filters, or heaters. Performance was reported to be indistinguishable from that obtained when using fuel oil.

The results secured from this work in Great Britain agree in practically every respect with those recently reported by Barkley, Hersberger, and Burdick[2], at the Joint A.I.M.E-A.S.M.E. Fuels Conference in Pittsburgh. In both cases, it was found desirable to use about 40 per cent coal, pulverized 98-99 per cent through 230-mesh U.S. standard. In stoppage and pumping, local overheating must be avoided. The colloidal fuel could be handled satisfactorily by pumps and burners and performed much the same as oil in the furnace.

From a practical standpoint the information for the successful use of colloidal fuel now seems to be available. It remains to be seen if this fuel will find any extensive application in either Great Britain or the U.S.

Liquid Fuels From Coal

Research work to convert coal to oil and gasoline started in Germany about 1913. By 1927 the work had progressed far enough to allow that country to embark on a full-scale commercial development. It is now believed that one-half to two-thirds of the gasoline Germany has available for fighting the war comes from these plants. Production comprises not only gasoline but diesel oil, fuel oil, and a reasonably good grade of lubricating oil. Obviously, this whole development was part of the plan to make that country as self-sufficient as possible.

The British people were much less aggressive in their approach to the production of synthetic liquid fuels. The Fuel Research Station carried out a considerable amount of laboratory work on the Bergius process of coal hydrogenation. In this method, the coal is mixed with a heavy oil, a small amount of a catalyst such as tin oxide is added, and the mixture is pumped, with hydrogen, under high pressure into a converter. Here a partial conversion of the coal into heavy oil, light oil, and gases takes place. The product from this first step is separated into solid and liquid. Some of the heavy oil goes back to be mixed with the coal while the remainder goes on to a second stage of hydrogenation to increase the yield of light oil and gasoline.

In essence the process may be viewed as one of increasing the hydrogen content of coal. Bituminous coal normally contains around 5 or 6 per cent hydrogen and a small amount of oxygen. Petroleum contains around 13 per cent hydrogen. By subjecting coal to the action of hydrogen under high pressure and at temperatures near 470° C., in the presence of a catalyst, the oxygen is removed and the hydrogen content increased with the formation of a liquid fuel similar to petroleum. This process yields a gasoline with excellent antiknock properties.

About 1930, Imperial Chemical Industries became interested in the commercial development of coal hydrogenation in Great Britain. After extensive pilot-plant experiments, construction was started on a plant to produce about 3,500 bbl. of gasoline per day. At that time there was a full exchange of information with German engineers to take advantage of the progress that had been made in that country. This new plant was completed about 1935 or 1936 and has operated successfully since that time.

Through the kindness of Imperial Chemical Industries, we were permitted to make a detailed examination of the entire installation. The construction of the converters alone presented a difficult engineering problem because they operate around 4,000 lb. per sq. in. while they are exposed to the action of hydrogen gas and certain corrosive conditions existing in the oil-coal mixtures. British practice has been to make forgings of the desired size and carry

*Assistant Chief, Fuels and Explosives Service, Bureau of Mines. Abstracted from a paper contributed by the Fuels Division, American Society of Mechanical Engineers, at the annual meeting of the society, New York, N. Y., Nov. 29-Dec. 3.

1. The information on this investigation was provided through the kindness of W. Idris Jones, research department, Powell Duffryn Associated Collieries, Ltd.

2. "Laboratory and Field Tests of Coal-in-Oil Fuels," by J. F. Barkley, A. B. Hersberger, and L. R. Burdick, preprint for A.S.M.E. Transactions.

the liquid in a separate container in the inside. This container is made of alloy steel to withstand the corrosive conditions, but it does not carry the pressure. Closures for the converters, all valves, pipe fittings, heat exchangers, compressors, and paste-handling equipment presented special engineering problems that were met and conquered.

Control of the high pressures, liquid levels, flow rates, and temperature necessitated the development of a large variety of special gages, measuring, and controlling equipment. The problems have now been solved so successfully that plant operation is virtually automatic. Relatively few men are needed in the control room and their duty is to see that the controls are functioning properly.

In spite of the success with which this plant operated, there was no further commercial development of coal hydrogenation in Great Britain, apparently because it was cheaper to import gasoline and oil instead of making it from coal.

The Bergius coal-hydrogenation method is not the only one available for converting coal to liquid fuel. The Fischer-Tropsch process, also developed in Germany, can be used. Here the coal or other fuel is first converted into carbon monoxide and hydrogen; these gases are passed over a catalyst, usually cobalt and thorium oxide on kieselguhr, at a carefully controlled temperature to obtain waxes, oil, gasoline, and hydrocarbon gases. The gasoline is of comparatively low octane value, but the oil is an excellent diesel fuel and can be converted to a satisfactory lubricating oil.

The Fischer-Tropsch plants in Germany are producing about one-fifth as much oil and gasoline as the Bergius plants. In Great Britain, however, there has been no commercial development of the Fischer-Tropsch process. The Fuel Research Station is engaged in extensive laboratory work and has made some very valuable discoveries concerning the catalysts, methods of preparation, conditions of operation, and in the preparation of lubricants. Their work will form an excellent basis for future commercial developments in Great Britain.

Governmental and scientific circles in Great Britain are now fully awakened to the importance of these proceses for making liquid fuels from coal. Strong pressure is arising to force increased activity with respect to the Fischer-Tropsch process, even before the war is over. They are looking at the methods, and particularly the Fischer-Tropsch, not only with respect to liquid fuels but also as a source of raw material for synthetic rubber, plastics, explosives, and chemicals. It is to be hoped that this realization of the potentialities inherent in these developments will arise in the United States.

ABSTRACTS

of papers presented at the annual meeting of the American Society of Mechanical Engineers, New York, Nov. 29-Dec. 3

High-Temperature-Steam Corrosion Studies at Detroit

I. A. ROHRIG, R. M. VAN DUZER, JR., and C. H. FELLOWS, Detroit Edison Co.

A PROGRAM was undertaken by Detroit Edison Co. to determine the rate of corrosion and the relative corrosion resistance in an unstressed condition of various materials that could be used in the construction of steam generators, piping, and turbines. Specimens were exposed in a steam atmosphere at 380 lb. per sq. in. and at temperatures of 925° F. and 1,100° F. The investigation required 5 years for completion; during that time 46 different materials were studied, including nickel, nickel-copper alloys, chromium and chromium-nickel stainless steels, medium and low-alloy steels, carbon steels, and alloy cast iron. The tests were conducted under plant-operating conditions, and samples were exposed in superheated station steam for periods ranging from 4,000 to 16,000 hours. Weight-loss, hardness, and metallographic data were obtained after successive exposure periods for many of the samples. Trends in the corrosion rate were plotted for some of the materials.

The test results indicate that the weight loss of plain-carbon steel exposed to 1,100°F. steam continues at a high rate, whereas the rate of loss of the alloyed materials decreases with time. The high chromium-nickel and the 12-chromium stainless steels were the most corrosion-resistant. The corrosion rate of 0.50 molybdenum and 1.0 chromium steels compared favorably with that of steels containing 5 chromium. Nonferrous materials were not as corrosion-resistant in high-temperature steam as the high-alloy ferrous materials. Materials which corroded rapidly at 1,100° F. corroded only slightly at 925° F., and at this lower temperature there was little difference between the rate of corrosion of plain carbon and alloy steels.

A New Approach to the Problem of Conditioning Water for Steam Generation

R. E. HALL, Director, Hall Laboratories, Inc.

MODERN boilers, because of their high operating pressures and ratings, and their high rates of heat absorption, intensify the problems associated with the continuous operation which is of such critical importance in our vast productive program. For instance, actual consumption of the boiler tubes by the high-pressure boiler water must be continuously guarded against.

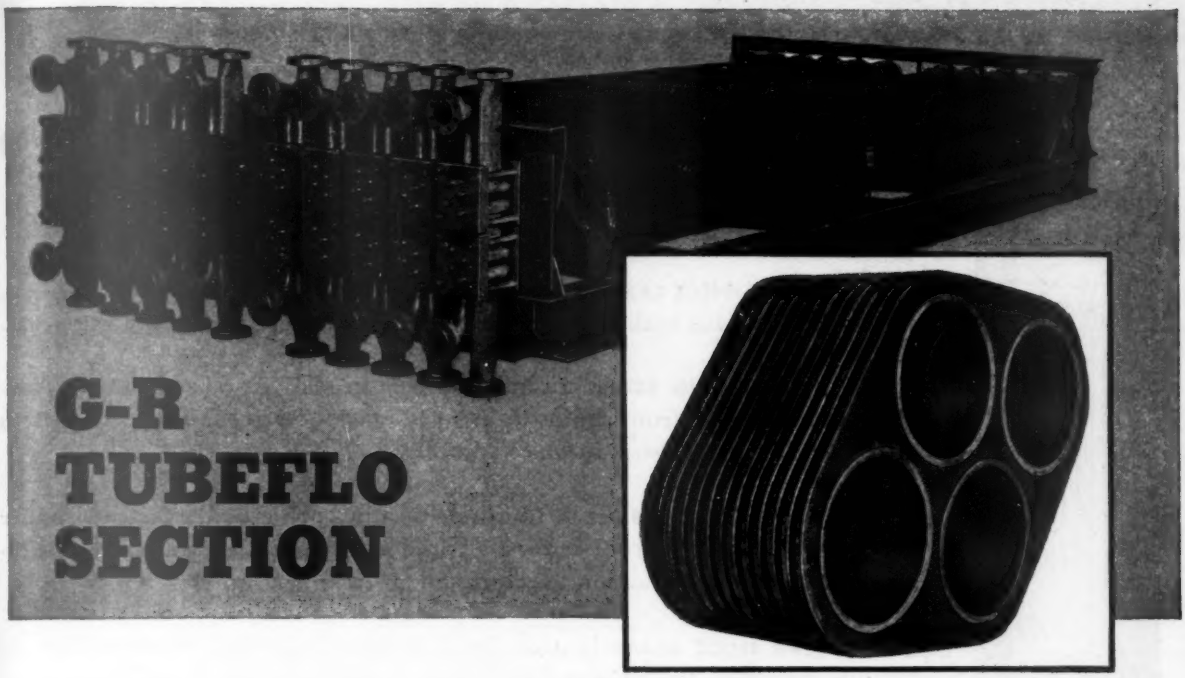
While sodium and potassium salts and minerals are approximately equally distributed in nature, natural waters contain mainly sodium salts in addition to their hardness, and very little potassium salts. While sodium and potassium are similar in many respects, they are different in that potassium is a requisite in plant growth, while sodium does not thus function. Thus, potassium is taken from the natural waters, and sodium remains. The result is that waters used for feed waters for the boilers are sodium containing, and this sodium content is increased by the use of sodium-treating chemicals, since they are cheaper than the potassium compounds, and since fewer pounds of sodium salts are required than would be required of potassium salts.

Tests were begun in the summer of 1942 to determine whether the substitution of a potassium equilibrium for the common sodium equilibrium in the boiler waters would be of benefit. In the ensuing months many problems have arisen, but have been met, and the results on the boilers are fully successful, both as regards siliceous deposits and corrosion by the bonded oxygen.

Heat Effects in Lubricating Films

A. C. HAGG, Westinghouse Research Laboratories.

HEAT effects in lubricating films are analyzed on the basis of simple shear of the lubricant, Reynolds logarithmic formula relating lubricant viscosity and temperature, and an equation relating the heat generation and heat flow in the film. The film-temperature dependence on velocity is determined, and the result is used to obtain the shearing stress and shearing rates. The formulas thus derived are useful in analyzing the performance of oil-film bearings. Experiments have been carried out with measurement of shaft and bearing-surface temperatures, as well as friction; the tests support the analytical results. An approximate means for judging the importance of film heating in a given case in terms of velocity and lubricant viscosity is suggested.



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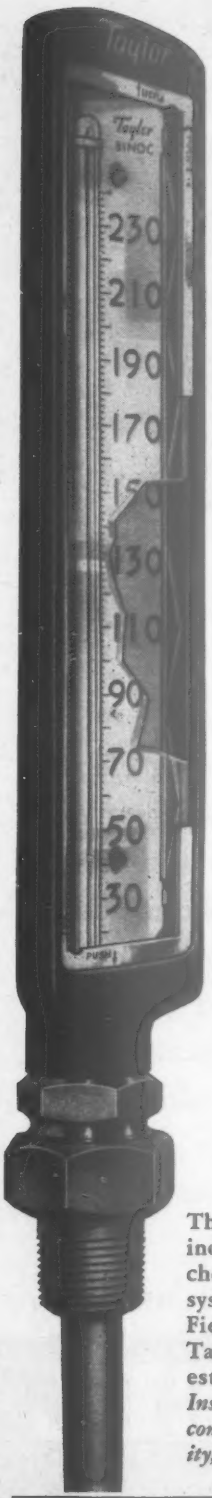

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WELL REPAIR COST VERSUS PROFITS

IF a faster production rate is contemplated at a producing well, the resultant increase in repair expense is an important factor and should be given thorough consideration. This problem usually arises if new equipment is installed or if reconditioning work is done. If the well produces a large volume of water, and the production rate is increased, the well-repair expense may show a sharp rise.

From an economic viewpoint the increased production must more than balance the increased repair expense plus any cash outlay for installation of equipment or reconditioning work. Repair expense usually is estimated from cost figures for similar wells producing approximately the same amount of fluid. Although this method is none too reliable for individual cases, it is perhaps the best and only basis for estimating expense.

Repair Expense

Estimates of future profits from operations are usually made by subtracting the estimated repair expense from the net value of the estimated gross oil production. These figures for future profit may be based on eliminable repair expense, total well-repair expense, or total operating expense.

The eliminable repair expense, as shown in the accompanying table, includes only repair material and supplies. It does not include labor and pulling unit charges. Repair expense, on the foregoing basis, is advantageous in some instances since it does not involve the question of whether over-all labor costs are affected by changes in operation at one well.

Total well-repair expense includes material, labor, pulling unit and all repair charges against the well. The total well-operating expense in addition to repair costs, includes indirect operating charges such as overhead, clerical expense, taxes, etc. Since these items are more or less fixed charges, and are not affected by a change in operations at one well, they are customarily disregarded in an analysis of this type.

As an example showing the importance of considering increased repair expense, the accompanying Table 1 has been prepared. The equipment at this particular well was in very poor condition and the estimated reserves amounted to only 13,000 bbl. of oil. The well was producing 8.5 bbl. of oil and 810 bbl. of water per day. New equipment had been installed at several other wells on the same lease and the oil production had been increased between 50 and 100 per cent. The estimated cost of installing new equipment and making repairs at well "A" to handle 1,600 bbl. fluid per day, amounted to $5,200.

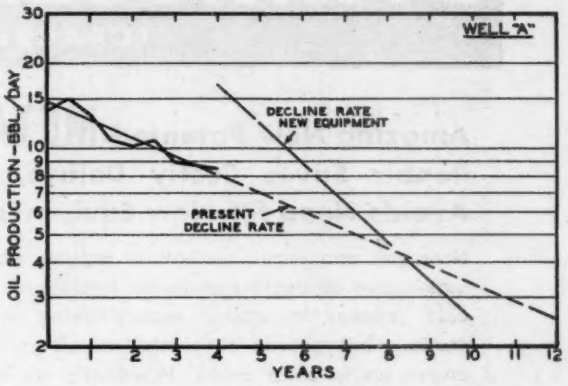

Fig. 1

The estimated production decline trend for this well is shown in accompanying Fig. 1. And extrapolation of the decline curve indicated that the well would reach an economic limit of 2.5 bbl. of oil per day in 8 years. The estimated decline curve for a faster production rate of 1,600 bbl. total fluid per day was based on the performance of other wells on the lease. The estimated yearly gross oil production as calculated from the decline curve is shown in Table 1. The net revenue from sales was calculated on the basis of $1.20 per barrel less one-eighth royalty. The future profits were estimated both on the basis of eliminable expense and total repair expense. The repair expense shown for continued operation of the old equipment was based on repair costs at the same well for the previous 3 years. The repair costs for the faster production rate were based on the average costs for other wells on the lease, handling approximately this amount of fluid. The monthly total well-repair expense amounted to $72 while the estimated total well-repair expense for the faster production rate is $165 per month. Estimated profits indicate that no major expenditure is justified.

TABLE 1—ESTIMATED FUTURE PROFITS—WELL "A"

Year—	Est. gross production (bbl.)	Net sales revenue	Elim. expense basis: Expense	Elim. expense basis: Profit	Total repair-expense basis: Expense	Total repair-expense basis: Profit
Old Equipment—800 Bbl. Fluid Per Day						
First	2,595	$2,730	$460	$2,270	$870	$1,860
Second	2,180	2,290	460	1,830	870	1,420
Third	1,940	2,040	460	1,580	870	1,170
Fourth	1,680	1,765	460	1,305	870	895
Fifth	1,455	1,530	460	1,070	870	660
Sixth	1,245	1,310	460	850	870	440
Seventh	1,090	1,145	460	685	870	275
Eighth	935	985	460	525	870	115
Total	13,120	$13,795	$3,680	$10,115	$6,960	$6,835
New Equipment—1,600 Bbl. Fluid Per Day						
First	4,695	$4,930	$1,250	$3,680	$1,980	$2,950
Second	3,410	3,580	1,250	2,330	1,980	1,600
Third	2,490	2,620	1,250	1,370	1,980	640
Fourth	1,800	1,890	1,250	640	.....	.....
Fifth	1,310	1,375	1,250	125	.....	.....
Total	13,705	$14,395	$6,250	$8,145	$5,940	$5,190

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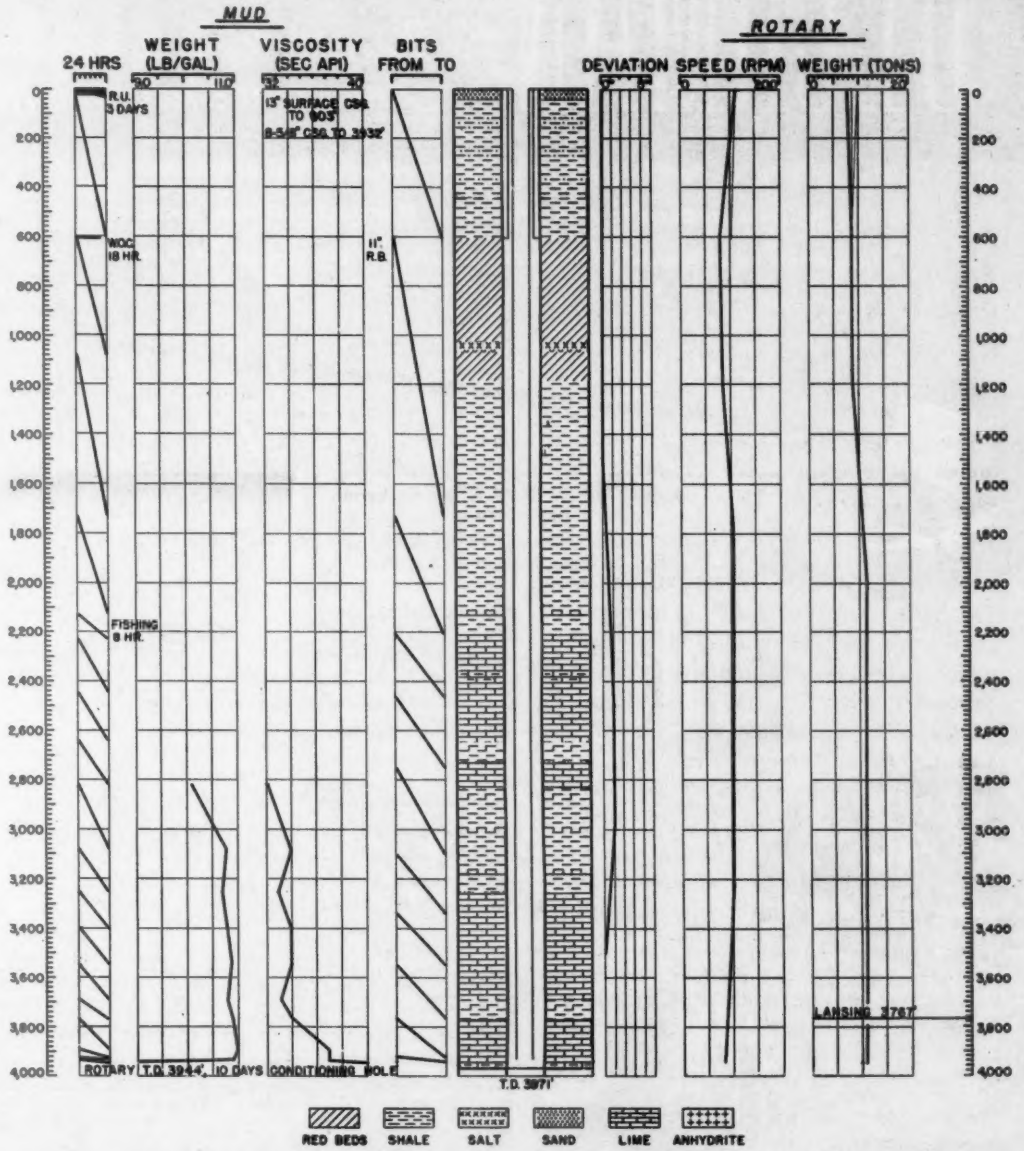

DRILLING DATA

Well elevation, derrick floor	2,084 ft.
Type rig	Mechanical rotary*
Date started rigging up	3-17-43
Date completed	4-20-43
Date started drilling rotary	3-20-43
Date set casing rotary	4-19-43
Total rotary time	30 days
	Hours
W.O.C., surface pipe	42
Logging, electric	none
Coring	none

*Rotary to 3,944 ft.; drill oil string plug, deepened to 3,971 ft. and completed with standard tools.

BITS USED

Type—	Number	Size (in.)
Rock bit	10	11

CASING AND TUBING RECORD

Size (in.)	Weight (lb.)	Depth (ft.)	Cement (sacks)
13	50	603	400
8⅝	32	3,932	200

COMPLETION

Rig	Standard tools
Acidizing	5,092 gal.

PRODUCTION TEST

Date	7-14-43
Time on the pump, hours	24
Oil, bbl.	132
Water, bbl.	60
Gravity, 60° F.	32
B.h.p., lb./sq. in.	1,100

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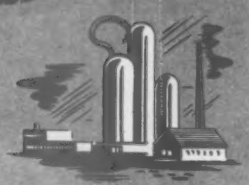

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Engineering Fundamentals

No. 115

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

APPLICATIONS OF DIRECTIONAL DRILLING

THE term directional drilling as it will be used in this discussion refers to the controlled steering of the drill stem in some desired direction in order to reach some chosen subsurface location. The term generally implies the intentional deflection of the hole from a vertical course.

A primary requirement in directional drilling is to have information as to the direction in which the bit is moving at any given depth. This information is obtained by means of directional-survey instruments which were described in Installment 113 of this series. It is obvious that a survey instrument itself does not have any control over the course followed by the bit, but merely indicates whether or not the bit is following the desired course and gives the necessary information for properly applying other tools to change or maintain the course of the well so that it will be bottomed at the desired point. A discussion of the tools and technique employed for this purpose will be postponed in this series until after a consideration of the various practical applications of the method.

Straightening a Crooked Hole

Generally, when it is discovered that a well is approaching, or has already attained, too great a deviation from vertical, the weight on the bit is lessened and the rotational speed of the bit increased in order to bring the well back to a more nearly vertical course. This method of straightening is successful in many cases, but experience has shown that under certain conditions a more economical method of straightening is to employ directional-drilling technique.[1] This situation is shown in Fig. 1. The well illustrated was drilled vertically, or nearly so, to point A. A survey of the hole when the bit had reached point B indicated that between points A and B the deviation exceeded the permissible maximum. The condition is remedied by plugging the well back to depth A, and employing directional drilling methods to drill the new hole AC in a vertical direction.

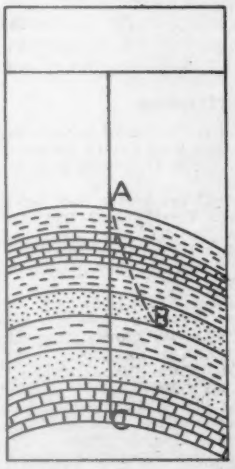

Fig. 1 (left)

Fig. 3 (below)

Sidetracking Obstacles in Hole

Oftentimes, during the drilling of a well, drill pipe or other equipment will be lost in the hole and cannot be fished out, so that the only alternatives which remain are the drilling of a new hole from the surface or plugging back the first hole to a point above the "fish" and drilling a new hole alongside. Generally the sidetracking operation, rather than complete redrilling, is resorted to, particularly if the fish is at sufficient depth that considerable time is saved by avoiding the redrilling of the upper part of the hole.

Briefly, a sidetracking process of this type consists of pouring a sufficiently large cement plug around and above the top of the fish that a solid seat will be provided for a whipstock and that the fish will be prevented from falling into the new hole. The whipstock, set on top of the cement plug, deflects the course of the bit to one side of the old hole containing the junk. As soon as formation cuttings and other evidence show that the fish has been successfully sidetracked, drilling is resumed in a normal manner. Control of weight on the bit will generally allow the new hole to resume a vertical course below the top of the fish. Whipstocks and other deflection tools, as well as the technique of using them, will be described in greater detail later in this series.

Sidetracking of junk in a producing well may sometimes prove to be very profitable.[2] In Oklahoma City, for example, junk had accumulated in the bottom of many of the old wells over a period of years. The junk had been tolerated, the wells having been produced as long as possible by flowing and later by pumping with the pump set above the junk. Decline of the bottom-hole pressure of the field, however, to the point that the fluid level no longer allowed setting the pumps above the junk, along with the fact that the junk could not be fished out, caused the operators to plug back to a suitable point above the junk and redrill the lower portion of such wells. As a result the pump could be set lower in such wells and a considerable increase in production obtained.

Sidetracking for Geologic Exploration

Many times, the drilling of a vertical well at a certain location may result in a dry hole while available evidence indicates that oil may be present in a given sand at a reasonably close lateral distance from the vertical hole. Illustrated in Fig. 2 are several possible sets of conditions which may result in such a situation. Fig. 2a represents a condition which may be encountered in the Gulf Coast area. The well X was drilled vertically to A, at a depth below that at which oil would be expected in the oil sand from which well Y produces. Due to no indication that the drill would ever penetrate the salt and find sediments below, the well was plugged back to point C and deflected off vertical toward the offset well Y. In such a case, oil may be encountered in the sand at point D and thus the "dry hole" converted into an oil well.

Fig. 2b represents a well X drilled essentially vertical from its surface location but finding no oil down to depth A. From available geological data, the presence of a fault is recognized between wells X and Y, so the well X is plugged back to point C where it is deflected from a vertical course to intersect the sand at point D, where prolific production at the crest of the trap is obtained. Information from the log of well Y, and from other completed wells nearby

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

may furnish valuable data in estimating the most likely course that the well X should follow from point C to encounter the oil sand at some favorable location such as point D.

Fig. 2c illustrates a well X which is drilled essentially vertical and encounters salt water in the expected oil-productive zone at point A. It may be known from well Y and the presence of noncommercial amounts of oil along with the water from well X, that well X is only slightly off the edge of the field. Thus, rather than sustain the total loss of a dry hole, the well X may be plugged back, to point B and redrilled, directionally, to some point C above the water level in the oil sand. Not only may the expense of drilling be recovered by such means, but often such a well may return a very sizable profit.

Dry holes drilled into limestone and lenticular sands may often be made into producers by plugging back and redrilling a deflected hole to penetrate the given lime or sand at an appreciable lateral distance from the point of penetration by the dry hole. Such a practice has been followed successfully in certain limestone fields of western Kansas.[3]

A study of records on the wells drilled in certain piercement-type salt-dome fields of the Gulf Coast have resulted in the profitable redrilling of certain wells using directional methods.[4] Such a situation may be illustrated in Fig. 2d. The well was first bottomed in the oil sand at point A, and either encountered salt water originally or produced for a period and was ready for abandonment because of rise of the water level in the sand above point A. In an effort to secure additional oil, the hole is plugged back from point A to point B and redrilled directionally to point C, encountering salt and completely missing the oil sand. The well is then plugged back to point D and redrilled to point E where a commercial oil accumulation is tapped. Due to uncertainties involved as to geologic irregularities that may sometimes prevent such redrilling from being profitable, it may be difficult to decide to make expenditures in such a persevering manner after two locations of the bottom of the hole have failed to yield commercial quantities of oil; but experience has shown that under favorable conditions, and when intelligent analysis governs such operations, the enterprise may be economically profitable.

Drilling a Relief Well

Possibly the most spectacular application of directional drilling has been its use in connection with the drilling of a relief well to intersect a wild and cratered well near its bottom so that mud and water may be pumped in to kill the wild well. This method was first applied in this way in 1933 and 1934 in killing a well in the Conroe field of the Texas Gulf Coast.[5] Since that time, similar methods have been successfully applied in killing wild wells in various parts of the world. One of the latest instances was the killing of a wild well in the Corpus Christi Bay of Texas in which certain new difficulties were encountered because of the great depth and because of the unusual location of the well.[6]

The drilling of a relief well is illustrated in Fig. 3.—The well A was drilled into the high-pressure sand, and a blowout resulted because of inability of the crew to control the excessive high pressure. Well-head connections and casing near the top of the hole may be abraded away by the high velocity of the escaping gas and sand in the gas stream. The unconsolidated nature of the sediments near the surface then allow the formation of a crater of large dimensions which makes the killing of the well at the surface practically impossible. An additional complication that usually arises is the ignition of the escaping gas and oil from a spark produced when a formation fragment strikes a steel object or from some other source. The only method yet devised by which such a well may be killed is the drilling of a relief well (well B, Fig. 3) located a safe distance away from the crater at the surface and so directed as to intersect or be sufficiently close to the bottom of the cratered well that water and heavy mud may be pumped into the relief well to kill the cratered well. A continual check is kept on the course of the relief well which requires the taking of directional survey records at close intervals and necessitates the use of a large variety of special deflection tools and other directional-drilling devices. Use of a chemical tracer pumped into the relief well gives a definite indication when contact is established between the relief well and the wild well.

Reaching Inaccessible Locations

Directional drilling has been widely applied to the tapping of oil accumulations located vertically beneath certain surface obstructions which prevented the building and operation of the drilling and producing equipment vertically above the subsurface location of the oil.

In the Huntington Beach field of California, about 90 wells have been diverted from surface locations on shore to intersect a 4,000-ft. sand at points up to 2,300 ft. horizontally offshore under the Pacific Ocean. Similarly, the method may be applied for extracting oil from beneath (1) business districts and other restricted zones in cities; (2) rivers; (3) rough terrain; (4) swamps.

A variation of this method in certain marine and swampy locations is the building of a large pier or foundation which will accommodate several wells placed closely adjacent to each other at the surface and directed outward to penetrate the producing horizon with an approximately regular subsurface spacing pattern. In this way, considerable economy is realized due to the saving of expense of building widely separated surface foundations to accommodate individual wells located vertically above their point of penetration into the sand. In the Gulf Coast of southern Louisiana 15 wells were drilled from one artificial pier island 132 by 82 ft. having six well foundations.[7]

Due to constantly improving technique and decreasing costs, the method is being employed on an increasingly larger scale as time goes along.

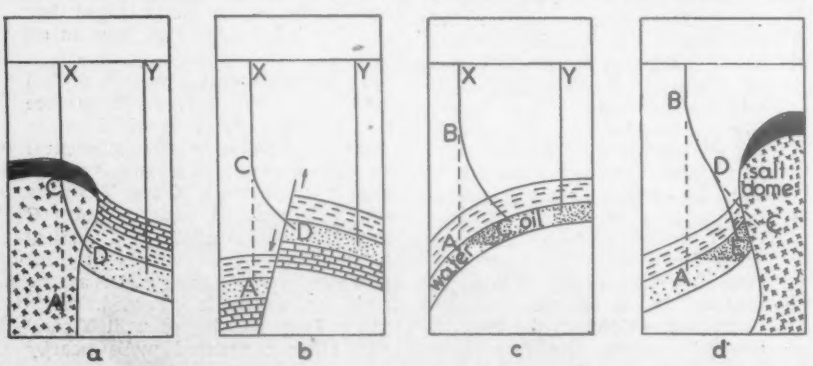

Fig. 2

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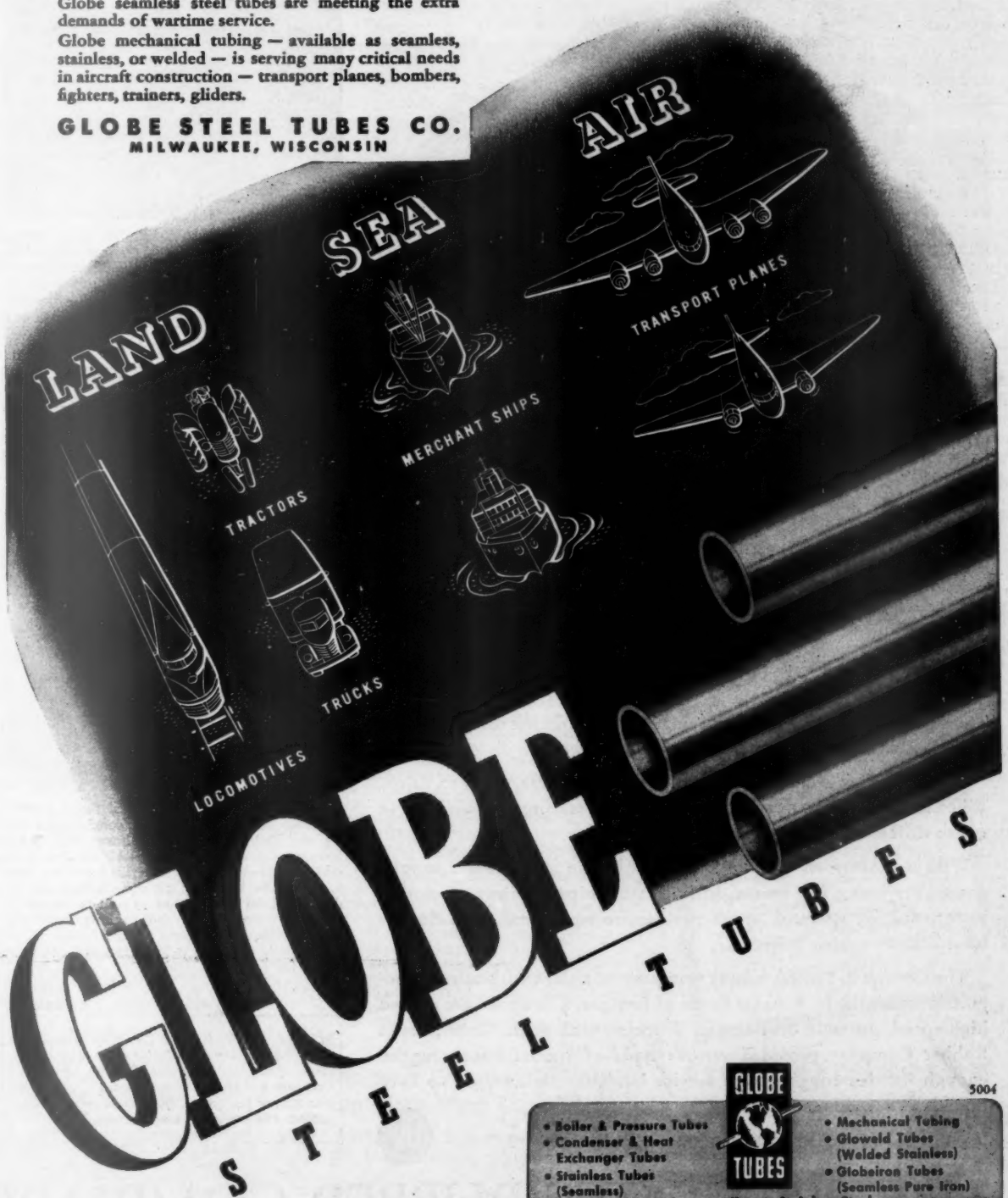

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REFINING

Lago Formally Opens Aruba Aviation-Gasoline Plant

WILLEMSTAD, Curacao.—New facilities of Lago Oil & Transport Co., Ltd., refinery on Aruba Island for manufacturing aviation gasoline were formally opened December 4, with all employes attending the ceremony. Officials of the Netherlands Government and officers of the U. S. Army and Navy were present, together with the heads of the operating company.

Fuel Too Potent for Present Engines Now in Production

DARTMOUTH, N. H.—A new motor fuel, so powerful that existing engines cannot use it full strength, is now being produced by Imperial Oil, Ltd., at an estimated cost of $1 a gallon, according to Charles Scrymgeour, general superintendent of the company's plant. Scrymgeour said the first gallon of the fuel, development of which was announced several months ago, cost more than $30,000, but that improvements had greatly lessened production expense.

Standard of Ohio Building Aviation-Gasoline Plant

CLEVELAND, Ohio.—Construction of an aviation-gasoline plant to cost $8,500,000, at its No. 1 refinery here, is announced by Standard Oil Co. of Ohio. The new plant is expected to be in operation next spring. Its capacity, the company said, would be "more than sufficient to carry 100 heavy four-engine bombers on a round trip between the British Isles and Berlin every 24 hours."

Inland District 3 Prices Pegged to New Ceilings

WASHINGTON, D. C. — Cents-per-gallon maximum prices for gasoline and distillate fuel oils shipped from refineries in Inland Texas and adjoining counties in Arkansas and Louisiana were established here last week by the Office of Price Administration, effective December 1. Action was embodied in Amendment 143 to Revised Price Schedule 88.

Three groups of ceiling prices are established by OPA action, depending upon ultimate destination of shipments.

Previously, refineries determined most of their ceilings by formula. No changes were made in the tank-wagon or service-station price regulations.

The new ceilings apply to gasoline and distillate fuel oils loaded into tank cars, motor transports and pipe lines f.o.b. refineries in the Texas Panhandle, West Texas, North Texas, East Texas and the Shreveport-El Dorado areas.

NEW CEILING PRICES

	Col. 1	Col. 2	Col. 3
Gasoline			
80-82 Oct. A.S.T.M.	7.000	6.750	6.625
80 Oct. '39 Res.	6.250	6.000	6.125
72-74 Oct. A.S.T.M.	6.000	5.750	5.875
63-66 Oct. A.S.T.M.	5.625	5.250	5.500
60-62 Oct. A.S.T.M. and below	5.250	5.000	5.125
Distillate Fuel Oils			
42-44 W.W. kerosene	4.500	4.125	4.375
41-43 W.W. kerosene	4.375	4.125	4.250
Range oil	4.000	3.875	3.875
No. 1 P.W. distillate	3.875	3.875	3.750
No. 1 straw	3.750	3.750	3.625
No. 2 straw	3.625	3.625	3.500
No. 3 fuel oil	3.500	3.500	3.375
32-36 gas oil, zero C.T.	3.375	3.375	3.250
Gas oil, ordinary	3.000	3.000	2.875
Diesel Fuels*			
58 D.I. and above	4.250	4.250	4.125
53-57 D.I.	4.125	4.125	4.000
52 D.I. and below	4.000	4.000	3.875

*These prices applicable to diesel fuels when sold for use in diesel engines only.

Column 1—For shipments to Arizona, Arkansas, Colorado, Louisiana, New Mexico, Oklahoma and Texas. Prices also apply to ultimate destinations in the counties of Jewell, Mitchell, Lincoln, Ellsworth, Rice, Reno, Kingman, Harper and all counties to their west in Kansas, and to ultimate destinations in Alabama, Mississippi, Tennessee, and the counties of Cape Girardeau, Dunklin, Wayne, Pemiscot, Scott, New Madrid, Butler, Bollinger, Stoddard and Mississippi in Missouri.

Products delivered into pipe lines for ultimate delivery to War Emergency Pipelines and lines with District 1 terminals are considered destined for District 1.

Column 2—Applies to all shipments to ultimate destinations in District 1 whether loaded at refineries or otherwise in any of the shipping areas.

Column 3—All other destinations.

Industry Spends $25,000,000 On Eight New Lube Plants

WASHINGTON, D. C.—Eight major plants, representing a total cost of about $25,000,000 to meet military and essential civilian demands for lubricating oils, have been finished

STOODY 6
Applied by Welding Reclaims Worn Valves

NOW worn valves, valve parts and pump sleeves can be reconditioned to outperform new factory parts by a simple oxyacetylene welding application using Stoody 6. This new Stoody alloy, composed principally of cobalt, chromium and tungsten, will not oxidize—even under intense heat, has high impact strength in relation to its hardness, offers excellent resistance to abrasive wear, and is perhaps the easiest of all hard-facing alloys to apply. Stoody 6 is highly efficient for hard-facing new or old internal combustion exhaust valves, gate, globe and angle valves, hot oil pump sleeves, etc.

Trial order of 10 lbs. of 3/16" diameter Stoody 6 at $4.25 per lb. will prove the merits of this alloy for any applications involving heat, corrosion, abrasion and impact. Available on AA-4 or higher priority rating.

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Stop wear . . . Eliminate Repair

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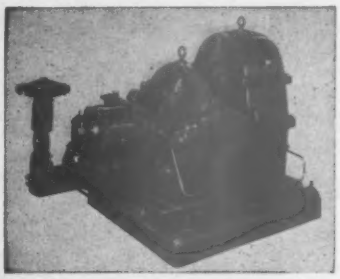

Type UG integral geared turbine. Turbine is supported by the gear at turbine shaft center line, thereby avoiding misalignment due to heating of turbine casing. Available in sizes up to 750 H.P. Arrangement of constant or excess pressure governor is shown.

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or are in advanced stages of construction by the petroleum industry, it was disclosed here last week by Harold L. Ickes, petroleum administrator.

The program was started shortly after Pearl Harbor, when it became apparent that productive capacity would not be sufficient to meet military requirements. In addition to the new construction, minor improvements were made in about 20 operating refineries to remove bottlenecks and speed output.

At the outset of the war, 74 refineries were producing about 105,000 bbl. a day of base stocks for lubricating oils, Ickes said. Today's production is geared to keep pace with the expanding military needs and to stockpile against the future as far as needs can be foreseen at this point.

The construction program has been financed by the industry from its private funds and at no cost to the public.

Four of the projects, Deputy Administrator Ralph K. Davies reported, called for construction from the ground up, while the other four are classed as "major alterations to existing facilities." All but three of the eight jobs have been completed and are in production. They are scheduled for completion early next year.

Approximately 10 per cent of all present production is utilized for passenger automobiles; 7 per cent of the present production is for grades used generally in commercial trucks and buses and the balance for aviation engine oil, lend-lease purposes and other uses such as refining special grades of industrial, commercial and medicinal oil.

The eight projects were sponsored as follows: Sinclair Refining Co., at Houston, Tex.; Standard Oil Co. of California at Richmond, Calif.; Mid-Continent Petroleum Corp., at Tulsa, Okla.; Texas Corp., at Port Arthur, Tex.; Quaker State Oil Refining Corp., at Emlenton, Pa.; Sun Oil Co., at Marcus Hook, Pa.; Champlin Refining Co., at Enid, Okla., and Gulf Oil Corp., at Port Arthur, Tex.

Stocks of Excess Materials Now Available to Refiners

WASHINGTON, D. C. — United States refiners and contractors can speed up construction of aviation-gasoline plants and special refining units by obtaining new material and equipment that has been declared "excess and available for war plants."

"There are numerous 'excess materials' stock piles throughout the country," Petroleum Administrator Ralph K. Davies said. "Alert job personnel can pick up many items from these stocks and, as a result, hasten completion of plants and special refining units."

Two of the larger stock piles are in Houston, Tex., and Los Angeles, Calif. These materials at present are available only to refiners building aviation-gasoline plants. In recent months, some operators have expressed the desire to have these stocks made available for maintenance, repair, and operation purposes also. PAW is studying the advisability of using excess stocks for these purposes.

Excess stocks in the two cities are handled by warehouses that have set up simple, effective redistribution systems. Procedures necessary to obtain desired items have been reduced to a minimum, so that, if necessary, an operator can obtain supplies from these stocks in less than 24 hours. Refiners and contractors may obtain specific information on the location of the major "excess materials" stock piles by writing to: "Redistribution Section, Construction Division, Petroleum Administration for War, Washington 25, D. C."

Mr. Davies reminded oil operators that PAW's Surplus Redistribution program is still in effect. Under this plan, all oil operators itemize their surplus stocks of materials and file these lists in PAW district offices. Lists of surplus stocks are made available to operators in need of materials. Details of the purchases are arranged between the oil operators concerned.

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Engineer experienced in the rating and mechanical design of oil and gas separators for the petroleum industry.

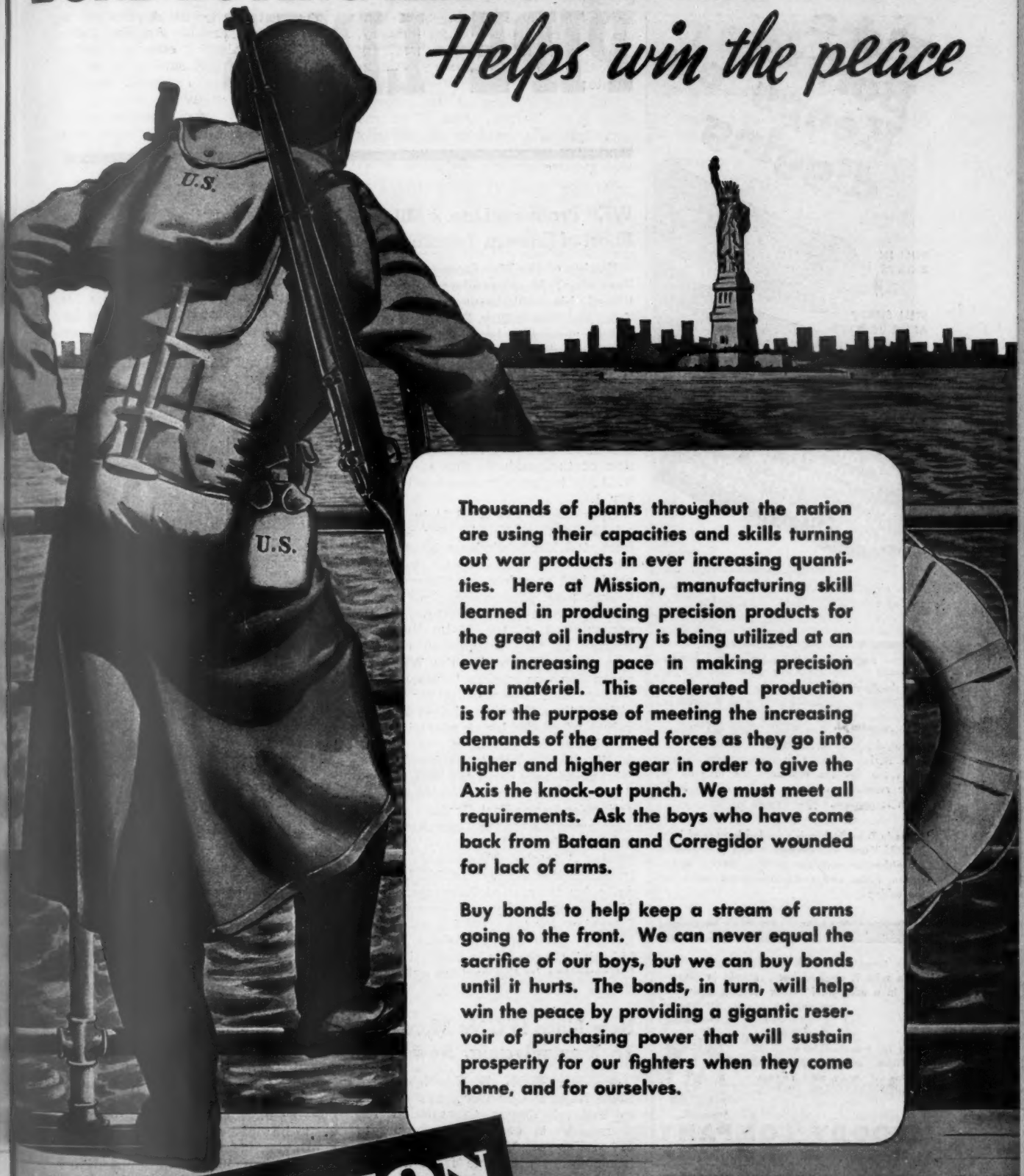
Experienced heat exchanger rater and designer for oil refinery and chemical plant equipment for the petroleum industry.

Permanent positions with a well - established, growing firm located in the East Texas-North Louisiana area. Give complete information in first letter, including education, experience, age, draft status. If your qualifications fill the bill, conference will be arranged at our expense. Address: 301 City Bank Building, Shreveport 23, Louisiana.

(Those now engaged in essential war work at their highest skill not solicited.)

BOND BUYING HELPS WIN THE WAR...

Helps win the peace



Thousands of plants throughout the nation are using their capacities and skills turning out war products in ever increasing quantities. Here at Mission, manufacturing skill learned in producing precision products for the great oil industry is being utilized at an ever increasing pace in making precision war matériel. This accelerated production is for the purpose of meeting the increasing demands of the armed forces as they go into higher and higher gear in order to give the Axis the knock-out punch. We must meet all requirements. Ask the boys who have come back from Bataan and Corregidor wounded for lack of arms.

Buy bonds to help keep a stream of arms going to the front. We can never equal the sacrifice of our boys, but we can buy bonds until it hurts. The bonds, in turn, will help win the peace by providing a gigantic reservoir of purchasing power that will sustain prosperity for our fighters when they come home, and for ourselves.

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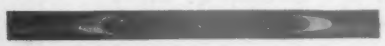
STOODY TUBE BORIUM* KEEPS DITCHER TEETH SHARP ...ELIMINATES FREQUENT SHUT-DOWNS FOR TOOTH CHANGES...CUTS REPLACEMENT COSTS UP TO 75%

The two ditcher teeth pictured above were used on the same machine and operated under identical conditions.
The unprotected tooth at the top had to be sharpened every three days and was too short for further service after six sharpenings.
But the Borium-protected tooth at the bottom operated for 40 days and wore only ½". It was simply resharpened in the forge, retipped with Tube Borium, and put back on the ditcher for another 40 days' service.
Before the tooth was finally worn out, it had operated a total of 120 days!
Tube Borium makes such savings possible because the deposits represent the ultimate in wear resistance and the ability to cut hard earth formations.

*Stoody Tube Borium is supplied in rods of ⅛", ¾", ¼" and ⅜" diameters and is available for either oxyacetylene or D.C. electric application. Prices and specifications are yours for the asking.



These tungsten carbide particles do not melt when tube is applied but are held in suspension in a mild steel matrix forming a deposit resembling coarse sandpaper.

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PIPE LINES

WEP Products Line 2 Miles Short of Eastern Terminal

Testing of the War Emergency Pipelines, Inc., 20-in. products line continued this week between Beaumont, Tex., and Norris City, Ill. Only 2 miles of line remain to be laid on the eastern extension to complete the products system to the East Coast.

The Petroleum Administration for War at Washington, D. C., announced that all critical materials for stations south of Norris City have been received or are in transit. Initial operation of the products line to Linden, N. J., is tentatively scheduled January 1.

Operation of the WEP 24-in. crude-oil line east of Norris City was interrupted last week by a break near Okeana, Ohio. Repair crews early this week had completed replacement of broken pipe. Meanwhile, time lost in normal crude-oil runs through the eastern end of the 24-in. line was utilized to rush installation of several gate valves which the WEP organization was anxious to place. WEP management was waiting for a propitious time for installation of the valves when the break necessitated a shutdown of pumping operations. PAW estimated that the break at a joint previously damaged in construction caused a loss of 700,000 bbl. in deliveries to the East Coast.

Shipments from the Longview, Tex., intake of the WEP crude-oil line December 1 totaled 305,083 bbl., slightly under the average of 308,746 bbl. daily for the period November 13 to 19. Average daily shipments from Longview for the first 5 days of December were approximately 171,000 bbl. daily, apparently reflecting the interruption in the eastern extension.

New Lines to Give More Gas To Pennsylvania, New York

WASHINGTON, D. C.—New York State Natural Gas Corp. has applied to Federal Power Commission for permission to construct and operate 127 miles of 12¾-in. natural-gas transmission pipe line from a point on the boundary line between Greene County, Pennsylvania, and Wetzel County, West Virginia, in a northeasterly direction to a terminal point in Clarion County, Pennsylvania.

The proposed line will connect at the Pennsylvania-West Virginia boundary with a 12¾-in. line which Hope Natural Gas Co. proposes to construct, and the terminus in Clarion County will connect with the 12-in. line now leased and operated by the applicant and proposed to be purchased by applicant from Peoples Natural Gas Co. That line extends approximately 90 miles to a point in Potter County, Pennsylvania, where it connects with the southern extremity of the applicant's existing transmission pipe line system.

The purpose of the construction is to enable the applicant to receive gas from Hope Natural Gas Co. at the Pennsylvania-West Virginia State line and to deliver it into its existing pipe line system for resale to other gas companies operating in Pennsylvania and New York.

Hope Natural Gas Co., Clarksburg, W. Va., has applied for authority to construct and operate 18 miles of 12¾-in. transmission pipe line extending from Hope's existing Hastings compressor station in Wetzel County, West Virginia, to the West Virginia-Pennsylvania boundary line terminus of the proposed line of New York State Natural Gas Corp., and 2 additional steam-driven natural-gas compressors at the Hastings compressor station aggregating 4,000 hp. with additional boiler and auxiliary equipment.

It is expected that in order to supply market demands, New York State Natural Gas Corp. will call upon Hope for 50,000,000 cu. ft. of gas daily.

Wartime Pipe-Line Work Ninety Per Cent Completed

WASHINGTON, D. C.—The wartime pipe-line program is 90 per cent complete, it was reported here last week in a general review of the emergency petroleum transportation operations by the Petroleum Administration for War. Fourteen major projects have been completed, leaving five more of the total authorized yet to be finished, according to Ralph K. Davies, deputy administrator.

More than 10,000 miles out of an authorized 11,338 miles of pipe lines have been constructed, converted from natural gas delivery, or reversed in flow.

Total new construction to Novem-

ber 1 amounted to 6,457 miles, of which 3,824 is new pipe and 2,633 is second-hand pipe.

A total of 333 of 435 scheduled miles of existing natural gas lines have been converted to petroleum.

Approximately 3,303 miles of existing pipe line have been reversed in flow in order to tie them into the single system.

"In early 1941 pipe line transportation of oil to the eastern states amounted to about 42,000 bbl. a day," Davies said. "Today this underground flow exceeds 475,000 bbl. a day; by spring the flow is scheduled to advance to about 700,000 bbl. a day."

Davies revealed that with the big-inch line reaching capacity performance, tank-car shipments to the East Coast have been reduced to less than 800,000 bbl. a day allowing the ODT to assign additional cars to the Southwest-to-Midwest and Southwest-to-California runs. Of the 74,000 tank cars formerly in East Coast service about 66,000 now remain.

Since January of this year rail transport has also included the shipment of kerosene in drums. During the past heating season this movement reached a peak of 25,000 bbl. a day. Inland waterway transportation has been boosted from 64,000 bbl. a day in April 1942 to 168,000 bbl. a day November 1.

With the addition of more units and better facilities, motor truck haulage of oil has been steadily increased to a point where 25,000 tank cars have been transferred from short haul to long-haul movement.

Sun Plans to Link Fields With Corpus Christi

WASHINGTON, D. C.—A pipe-line system connecting Sun Oil Co. production in Southwest Texas with Corpus Christi is foreshadowed by an application filed with Petroleum Administration for War by Sun Pipe Line Co. The company seeks permission to lay 144 miles of line, which would include 84 miles of 8-in. from Harbor Island to the Seeligson area, and 60 miles of 6-in. to properties in Starr County and intermediate points. Sun's daily production in the Mirando area is 4,625 bbl.; Rio Grande Valley area 4,610 bbl.; Beeville area, 2,100 bbl. Increased production is expected to result from recent development work.

Pipe Lines Handle Record Volume in Third Quarter

WASHINGTON, D. C. — Crude oil and refined products handled through pipe-line facilities of 46 companies reporting to the Interstate Commerce Commission established a new all-time peak of 502,707,874 bbl. in the third quarter of 1943, it was reported here last week.

Transportation revenue increased approximately 16 per cent in the third quarter over the same period a year ago and traffic was up 23 per cent, according to the ICC compilation of statistical data.

Transportation revenue totaled $68,417,356 against $59,009,167.

Largest revenue and traffic, and one of the largest percentage gains, were shown by Humble Pipe Line Co., Houston, Tex., which showed $6,194,161 on 50,951,116 bbl. against $3,934,639 on 31,937,242 bbl. in the earlier period.

Sinclair Refining Co., with $5,844,648 on 28,963,144 bbl., was second in revenue, but Texas Pipe Line Co., with $4,047,757 on 33,903,209 bbl., was second in volume.

Among refined products carriers Great Lakes Pipe Line Co. reported for the 1943 quarter $2,583,743 against $2,385,373 on 5,833,054 bbl. and 5,404,487 bbl., respectively; while Phillips Petroleum Co. reported for the 1943 quarter $1,772,961 against $1,793,001 on 4,590,712 bbl. and 4,406,744 bbl., respectively.

Stanolind Pipe Line Co. (Standard of Indiana) reported $5,308,374 against $5,667,167 on 22,148,183 bbl. and 22,054,868 bbl.

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The H & M Pipe Cutting and Beveling Machine cuts any size pipe with speed, economy and accuracy.

SPEED: Complete cut and bevel can be made on 12 inch pipe in about 2 minutes.

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Getting there first with the most

Air transport is dependent upon the high octane fuel which is being produced faster, today, than some of the lower octane gasolines common to American motorists.

One thousand four-motored planes in flight would require about 1,250,000 gallons of high test gasoline for a three-hour operation. Dow is supplying refiners with huge quantities of Caustic Soda to assist in the production of this vital fuel. This important industrial chemical is used as a reagent to remove sulphur from petroleum products, as a refining and sweetening agent for gasoline.

Refining is only one branch of industry that finds Dow Caustic Soda indispensable. Producers of rubber, textiles, soap, plastics and more than half a hundred other industries depend on Dow for their supply of this essential industrial chemical. Recent additions to facilities for production make Dow Caustic Soda readily available to industry in all parts of the United States.

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Natural Gas

Manufacturers Plan Union With Associated Companies

WASHINGTON, D. C. — Federal Power Commission announced a hearing to be held December 9 on an application of the new Manufacturers Light & Heat Co. for authority to acquire by merger and to operate the natural-gas facilities of the old Manufacturers Light & Heat Co., Greensboro Gas Co., Manufacturers Gas Co. and Pennsylvania Fuel Supply Co., associated companies, incorporated under the laws of Pennsylvania, and to acquire by purchase and to operate the natural-gas facilities of another associated company, Fayette County Gas Co. No capital costs or plan of financing are contemplated.

The principal reason for the proposed consolidation is the elimination of voluminous bookkeeping records and complex problems of intercompany operation of five affiliated companies operating as an integrated system. The natural gas properties involved are situated in Pennsylvania, Ohio, New York, and West Virginia.

Demand for Natural Gas in Chickasha Field Expands

OKLAHOMA CITY, Okla. — Demand for natural gas from the Charlson deep zone of the Chickasha field, Grady County, increased 15,094,000 cu. ft. daily for December, the state Conservation Department has been advised by purchasers. Total December demand for the field was estimated at 2,920,000,000 cu. ft. or 94,194,000 cu. ft. daily. The November demand was estimated at 79,100,000 cu. ft. daily.

Allowable production for the Medrano sand zone in the Cement field of Caddo County continued pegged at 23,626,000 cu. ft. daily. Adjustments on this allowable may be made during the month as a result of new completions.

Panola Gas Play Calls for New Construction Work

WASHINGTON, D. C. — Following recent extension of the Carthage gas field, in Panola County, Texas, 5 miles to the west, with further exploration in prospect, Arkansas Louisiana Gas Co. has asked permission to construct and operate additional facilities in that area and to acquire others, needed to supplement the company's supply of gas. The Federal Power Commission set December 9 as the date for a hearing on the application.

Arkansas Louisiana proposes to construct and operate a 12-in. pipe line, 8.7 miles long, from Arkansas Fuel Oil Co.'s gasoline plant in Panola County to the southern terminus of the applicant's existing line in the same county, and a telephone line to parallel the entire proposed line and applicant's existing line, a distance of 0.8 mile. The facilities sought to be acquired consist of 12,200 ft. of 4 and 8-in. gathering lines to be constructed in Carthage field by Walter B. Smith and others and then conveyed to the applicant.

Gas Conservation Plan Submitted to Canada

CALGARY, Alta. — A conservation plan for Turner Valley involving a capital outlay of $3,000,000 and expected to materially extend the life of the field has been outlined by T. R. Weymouth, consultant on gas conservation for the U. S. Government, in a report to the Natural Gas and Petroleum Conservation Board of Alberta. Mr. Weymouth's services were loaned to the board last spring when he made a survey of the field on which his report is based.

"Of a total estimated reserve of 402,200,000,000 cu. ft. of dry gas which might be recovered from Turner Valley," the report states, "only 223,100,000,000 cu. ft. could be secured under the prevailing method of operation while 119,100,000,000 cu. ft. would be dissipated in flares or otherwise.

"By consolidating the two Royalite plants, and by installing facilities for transmitting the residue gas from the British American and Gas & Oil Products plants to the Royalite consolidated operation for compressing and transmitting to suitable locations of the gas cap for repressuring and storage, all excess gas over and above that required for immediate demands, the quantity of gas flared can be reduced from 179,100,000,000 cu. ft. to 20,000,000,000 cu. ft., 159,100,000,000 cu. ft. being recovered for the use of gas consumers of the province."

Under the plan, all wet gas in the field will be sent to absorption plants for extraction of the gasoline. All residue gas from these plants would be sent to the Royalite Oil Co. at the site of its present No. 1 plant. Royalite will purchase all residue gas from the field, by whomsoever produced, and will utilize it as far as necessary to meet the demands of the Canadian Western Natural Gas, Light, Heat & Power Co., which supplies Calgary and other communities in southern Alberta. Any excess over Canadian Western needs will be stored either in the depleted sands of the Bow Island field, or in the gas cap of Central Turner Valley. The Royalite company will pay 2 cents per 1,000 cu. ft. for gas utilized and 0.5 cent per 1,000 for gas stored.

The Weymouth report has already been given the approval of the Alberta Conservation Board. Consolidation of the two Royalite absorption plants was started some time ago, and is now nearing completion. Some years ago the old pipe line from the Bow Island field to Calgary was overhauled and compressor equipment provided to force surplus Turner Valley gas into the Bow Island sands, which was done at the rate of 5,000,000 cu. ft. a day. It is claimed the plan will increase the present estimated life of the field, 18.7 years, to 30.12 years. Storage of gas in Turner Valley will be in an isolated part of the gas cap entirely under the control of the Royalite company, gas being forced back into the formation through old wells in Township 19.

Columbia Expected to File Recapitalization Plan Soon

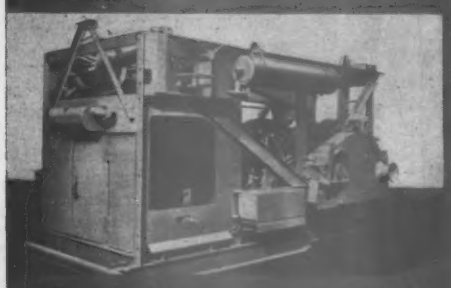
NEW YORK. — Columbia Gas & Electric Corp. is expected to have its plan for recapitalization filed within the next few weeks. The chief feature of the plan probably will be its provisions for disposing of the system's electric properties, which constitute a minor part of Columbia's operations.

About two-thirds of the system's revenues is derived from subsidiaries producing and distributing natural, manufactured and a mixture of manufactured and natural gas in New York, Pennsylvania, Virginia, West Virginia, Ohio, Kentucky and Maryland. Through the 30-year contract recently entered into with Tennessee Gas & Transmission Co. for supplying natural gas from Texas fields the company has assured itself of adequate natural-gas supplies in the important Appalachian area served.

Columbia may segregate the electric properties through distributing to its preferred stockholders the interest which it holds in the three subsidiaries. Cincinnati Gas & Electric Co., Dayton Power & Light Co. and Union Light, Heat & Power Co.

Bucyrus-Erie Spudders put NEW meaning in . . .

Mobility



With Bucyrus-Erie Spudders, mobility means more than mere "movableness;" it means really fast tear downs, speedy moves, and quick set-ups on new locations — for all three can be done in an eight-hour shift with as few as two or three men.

This kind of mobility cuts idle-rig time to a bare minimum, allows more time for actual drilling. The result is increased profit, for spudders make money only when they're making hole.

The secret of the moving speed of Bucyrus-Erie Spudders lies in their sturdy, compact construction, all-round balance, quick-telescoping derricks, efficient mountings. These features combine to give you spudders that really "get around."

And speed is the keynote of drilling with Bucyrus-Erie Spudders, too. The time saving efficiency of quick moves plus the extra footage from fast drilling means more profit on your drilling jobs. Investigate these spudders now — they're your key to extra money.

K-44

ARMY E NAVY

Bucyrus-Erie

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

Exploration and Drilling

Week's Highlights

EXPLORATION of sedimentary rocks below the generally prospected depths on proven structures throughout the Middle West and southwestern fields is rapidly taking form as a feature of operations projected over the next several months. Some portions of the northern Mid-Continent producing area have 1,000 ft. or less of potential sedimentation to explore below generally explored depths. But numerous highly prolific producing structures in East Texas, West Texas and the Gulf Coast overlie sedimentary rocks that exceed current maximum depths of exploration by 10,000 ft., or more.

The theory that no structural trap is condemned for deeper production until all sedimentary beds above granite or other basement rocks have been thoroughly prospected is gaining new converts with each passing month. Deeper exploration in proven fields to test the possible superimposition of structural traps over one another is gaining momentum with each successful discovery in this category. The fact is well established that multiple producing zones are outstandingly common in proven fields.

One trend in exploration thinking argues strongly that one of the most hazardous elements in wildcat drilling is removed when operations are confined to known structures. This argument, of course, is based on the hypothesis that structure is already proven in any oil field regardless of how shallow or deep is the producing zone. Areas with the maximum of sedimentary formations existing between known producing horizons and basement rock or limits of currently available drilling equipment, whichever is deeper, theoretically offer the greatest attraction. Other factors such as scope of the shallower structures, the general producing history of deeper beds and the economics of exploratory drilling logically have an important bearing on deeper testing in existing fields.

Assurance, however, that exploration departments are placing strong emphasis on the possible existence of deeper producing horizons in proven fields is given in current weekly reports on new operations. One of the most recent projects falling in the classification of this general discussion is a deep Wilcox test in the Conroe field, Montgomery County, Texas (p. 97). Conroe has produced approximately 160,000,000 bbl. of crude, chiefly from the Cockfield and Yegua in the upper part of the Claiborne and the field is estimated to have more than 540,000,000 bbl. of reserves remaining in those pays. The Wilcox test may be drilled to 12,000 ft. One eastern Montgomery County field, Fostoria, produces from the Wilcox which was hit at about 11,800 ft.

Several more West Texas fields producing from the Permian are earmarked for deeper exploration operations in the near future. Ellenburger in the Ordovician system is the chief objective because of its proven productivity but more recently the Silurian has produced on the flanks of the lime highs in Upton and Ward counties, giving operators still another deep potential pay at which to shoot.

In areas of exceedingly high cost drilling, such as in the deep basins of the Rocky Mountain district, oil companies are negotiating for an acceptable cooperative basis by which the deeper producing possibilities can be explored.

CANADA: In line with the general program to increase exploratory drilling next year, L. B. Currie, Canadian minister of mines, has announced that test wells will be started in three counties in Nova Scotia (p. 97).

COMPLETIONS IN ALL FIELDS . . .

(Week ended November 27, 1943)

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1943	1942
N. Y., Penna., W. Va.	50	20	2	72	137,866	3,128	3,155
Ohio	1	5	8	14	46,988	849	1,038
Indiana	1	0	3	4	6,326	201	309
Kentucky	3	17	3	23	49,723	429	172
Illinois	19	0	17	36	93,020	1,800	1,872
Michigan	7	1	8	16	37,472	578	626
Kansas	14	0	16	30	102,360	1,533	1,399
Nebraska	0	0	0	0	0	27	32
Missouri-Iowa	0	0	0	0	0	17	13
Oklahoma	17	1	6	24	59,449	1,074	1,054
Texas:							
North Central Texas	12	0	17	29	64,472	1,354	964
West Texas	18	0	4	22	93,125	836	1,214
Texas Panhandle	7	0	0	7	21,432	167	311
Eastern Texas	1	0	2	3	15,032	273	362
Texas Gulf Coast	3	1	2	6	46,653	423	624
Southwest Texas	5	0	9	14	78,980	829	947
Total Texas	46	1	34	81	319,694	3,882	4,422
North Louisiana	6	2	1	9	30,424	302	441
Louisiana Gulf Coast	2	0	0	2	21,746	329	411
Total Louisiana	8	2	1	11	52,170	631	852
Arkansas	5	0	1	6	23,369	248	184
Mississippi and Southwest	0	0	1	1	6,875	90	55
Montana	5	0	1	6	18,710	216	183
Wyoming	4	2	0	6	32,765	126	102
Colorado, Utah	0	0	0	0	0	22	23
New Mexico	5	0	2	7	25,427	209	217
California	28	0	3	31	106,563	1,241	702
Total United States	213	49	106	368	1,118,777	16,099	16,190
Total previous week	222	35	131	389			
Week ending Nov. 28, 1942	158	36	102	296			

PERMIAN BASIN

Fourth Pay Zone Seen in Winkler County Pool

MIDLAND, Tex.—Fourth producing stratum for the Keystone area of Winkler County was seen at Sinclair-Prairie Oil Co. 4-A J. B. Walton, SE SE Section 20, Block 77, Public School Land, 1 mile west by north of the Amon Carter Ellenburger discovery. The new pay project had show of oil at 7,288 ft. Drill-stem test from 7,268-88 ft., showed 50 ft oil, 270 ft. oil-cut mud and 990 ft. of mud when packer gave way and the rest of the test was lost. The show of oil came from lime and dolomite but the formation has not been positively identified. It is believed to be either Pennsylvania or Silurian. The three previous pays in the field are the upper Permian at 3,400 ft., the Ellenburger at 9,500 ft., and the Clear Fork, lower Permian, at 4,700 ft. Magnolia Petroleum Co. 21 State-Walton, in the Kermit pool, 2¾ miles southwest, had a show of oil in Devonian chert at 8,300 ft. and since the Magnolia discovery well was 1,200 ft. lower structurally than the Carter discovery, it is possible that the shows in the Sinclair well are from this zone, although no chert has been reported. Drilling ahead, the new prospect will test the Ellenburger and if nonproductive in this zone, will probably plug back to make a test of the new tratum.

Second and third wells in the Mabee pool of southeast Andrews County were in completion stages, and Texas Co. has made locations for 4 and 5 Mabee, with operations to begin immediately. Mabee 2 swabbed 129 bbl. oil with 4 per cent basic sediment in 22 hours, with 130 bbl. of sulfur water, and 3 Mabee swabbed 64 bbl. oil with 6 per cent basic sediment in 4 hours, and was being put on the pump.

WEST TEXAS WILDCAT COMPLETIONS

Borden County: W. S. Guthrie and Cosden Pet. 1 Ella M. Conrad, C NW¼ Sec. 79, Blk. 20, Lacava Nav. Sur. O.W.D.D. S.O. 3,960-4,150 ft., dry, T.D. 4,392 ft., O.T.D. 3,874 ft.

McCullough County: D. H. Brock 1 D. H. Cox, 235 ft. from N, 745 ft. from E, W 160 ac. Fisher Miller Sur. No. 2,482, dry, T.D. 1,003 ft.

Hockley County: Brown & Wheeler 1 Earl French, 660 ft. from S and W, Labor 22, League 75, Haskell County School Land, elev. 3,589 ft., Yates 2,530 ft., Andres 3,670 ft., dry, T.D. 6,511 ft.

Gaines County: Stanolind Oil & Gas 15 American Warehouse, deep test in Cedar Lake field, 1,980 ft. from S. and E, Sec. 5, Blk. H, D.&W. Sur., elev. 3,033 ft., dry, T.D. 11,954 ft., Ellenburger not reached.

SOUTHWEST NEW MEXICO

HOBBS, N. M. — Linking of the South Eunice and Lynn pools of southeast Lea County was seen at Continental Oil 1-A Myers, SW SE 29-22s-36e, which showed 100 ft. of oil and 2,300 ft. of water on drill-stem test from 3,643 to 3,710 ft. Operator was attempting to squeeze off the water and will complete as a pumper of possible. El Paso Natural Gas 1 Ginsberg, 7-25s-38e, had no shows on drill-stem test at 6,885 to 7,054 ft., and was drilling below 7,054 ft. Humble Oil & Refining Co. 1 Federal-Leonard, 12-26s-37e, elevation 3,012 ft., was drilling below 8,432 ft. Pay was expected within the next 100 ft. at H. P. Taubman 1 Sun-State, 18-17s-34e, west of the Vacuum pool, which was drilling below 4,700 ft.

SOUTHEAST NEW MEXICO WILDCAT COMPLETION

T. F. Morrow 1 State, NW NW Sec. 22-13s-35e, 5 mi. W by N of Tatum, elev. 4,071 ft., anhydrite 2,110 ft., Yates 2,900 ft., lime 4,308 ft., dry, T.D. 5,225 ft.

PANHANDLE

AMARILLO, Tex.—Disappointment was seen in Stanolind Oil & Gas Co. 1 Troy Broome, Donley County wildcat in Section 46, Block 20, H.&G.N. Survey, which showed salt water on drill-stem test from 4,786 to 4,866 ft. in granite wash, with a very small amount of gas. The test is projected to 6,500 ft. Drilling continued below 5,200 ft.

EASTERN TEXAS

Van Zandt County Wilcat Swabbing Oil in Travis Peak

DALLAS, Tex. — Superior Oil Co. 1 C. A. Groves, Van Sickle Survey, 3½ miles north of Clinton, indicated a new Travis Peak pool for East Texas when it swabbed fluid at the rate of 4 bbl. per hour from 8,552-70 ft. after acidizing with 5,000 gal. This well, with an elevation of 426 ft., was drilled to 9,002 ft. and plugged back to 8,886 ft. Top of Travis Peak was called 8,480 ft., and casing was perforated in the upper part of the formation. The fluid being swabbed is about 55 per cent oil and 45 per cent salt water.

Second well for the new Pettit lime pool of Rusk County, northeast of Henderson, was near completion. Beacon Oil & Refining Co. 1 R. T. Brown, Taylor Brown Survey, perforated casing at 7,244-64 ft. and was reported to be flowing 11 bbl. oil per hour. The oil tests 42.7 gravity. It is a southeast offset to the discovery well.

Prospects of opening a new Paluxy pool south of Winnsboro in Wood County were dimmed at Gulf Oil Corp. 1 K. C. Brewer, Lea Survey, when a core in the Paluxy section from 6,384-97 ft. recovered soft porous sand carrying salt water. The well is being drilled deeper. Shell Oil Co., Inc. 1 Whatley, deep test on the east side of Manziel field, was bottomed at 8,505 ft., attempting to get a successful drill-stem test. The well is reported to be showing a slight show of both oil and gas at this depth.

EAST TEXAS WILDCAT COMPLETIONS

Anderson County: Continental Oil 1 J. S. W. Landis, 330 ft. from NE and NW, SE½ S. Landis Sur., 2 mi. N Bradford, Woodbine 5,023 ft., dry, T.D. 5,225 ft.

Houston County: Continental Oil 1 Texas Long Leaf Lumber, 4,500 ft. from northerly NE, 2,700 ft. from northerly NW, H. W. Bozeman Sur., 8 mi. W by N Lovelady, slim hole test, dry. T.D. 5,004 ft.

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 4 crude oil	Distillate, allied products	Dec. PAW quota all oils	Nov. 27 crude oil
Arkansas	79,400	4,800	81,700	78,400
California	780,250	47,500	855,500	778,500
Colorado	7,350	.....	7,000	7,450
Eastern fields	69,875	8,900	85,900	71,150
Illinois	218,150	12,700	227,700	215,250
Indiana	13,525	.....	14,400	12,500
Kansas	267,100	6,100	291,100	273,200
Kentucky	24,600	3,000	28,500	23,350
Louisiana	352,800	22,000	375,700	351,025
North Louisiana	78,700	.....	.....	78,800
Louisiana Gulf	274,100	.....	.....	272,225
Michigan	60,100	100	57,100	54,100
Mississippi	49,650	.....	48,000	49,600
Montana	24,520	300	23,800	21,375
Nebraska	1,725	.....	1,500	1,700
New Mexico	112,550	6,000	116,600	112,950
Oklahoma	322,600	28,000	356,000	325,800
Texas	1,908,200	126,000	2,018,000	1,929,150
East Texas	369,500	.....	.....	376,400
West Texas	356,950	.....	.....	359,750
North Central Texas	143,200	.....	.....	141,900
East Central Texas	133,650	.....	.....	142,950
Texas Panhandle	90,600	.....	.....	85,500
Texas Gulf Coast	714,700	.....	.....	722,100
Southwest Texas	99,600	.....	.....	100,550
Wyoming	102,860	3,700	103,700	100,850
Total United States	4,395,255	269,100	4,694,200	4,406,350

Total production January 1-December 4, 1943 ..... 1,384,114,185 bbl.
Same period last year ..... 1,314,527,090 bbl.

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PATTERSON-BALLAGH PIPE WIPER

N. CENTRAL TEXAS

New Field Opened in Western Wilbarger County

WICHITA FALLS, Tex.—Texas Co. 1 Emma L. Main, SE NE Section 16, Block 8, H.&T.C. Ry. Survey, just east of the Foard County line, opened a new Gunsite lime field by flowing 19 bbl. of oil in 2 hours after acidizing with 1,000 gal. through 69 perforations in casing from 2,706 to 2,803 ft. The new strike lies 3 miles east of the Thalia pool and 6 miles west of the Fluhman pool, and is 13 miles southwest of Vernon. The test had logged a slight show of oil from 2,486-89 ft., another show in lime from 3,202-57 ft., and drilled to a total depth of 4,725 ft. in granite wash. Perforated at 4,106-21 ft. with 77 shots and acidized with a total of 5,500 gal., it showed about 1 gal. of oil per hour, and was plugged back to perforate in the upper horizon. Some operators are calling the producing zone the Canyon lime, which lies just below the Cisco group in the Pennsylvanian series.

In eastern Clay County, Shell Oil Co., Inc. 1 R. F. Wynn, Rooney Survey, Mississippi lime discovery, flowed 109 bbl. oil and 16 bbl. of water while perforating at 6,023-53 ft., and then flowed 203 bbl. of oil and 77 bbl. of water in 22 hours through tubing. It was being perforated further before making production test. The hole is bottomed at 6,795 ft. in Ellenburger lime topped at 6,706 ft., which proved dry with a show of oil and gas. The new strike is 3 miles east of Stephens pool which produces from the Mississippi lime.

Two wells in Tarrant County had reached the Ellenburger. Jesse Martin et al 1 R. B. England, Baker Survey, 2 miles northeast of Keller, elevation 785 ft., topped Ellenburger at 8,370 ft., and C. Andrade III 1 Sharpless, S. H. Thompson Survey, 6 miles west of Grapevine, elevation 626 ft., topped Ellenburger at 8,441 ft., showing a dip to the east of 230 ft. The wells are about 9 miles apart. On top of Simpson, the dip was only 44 ft. to the east, and on top of Barnett shale, only 29 ft., indicating a pronounced thickening in the lower beds to the east side of the Fort Worth basin.

NORTH TEXAS WILDCAT COMPLETIONS

Archer County: George W. Cooper 1 J. R. Parkey, Sec. 1 S.P.R.R. Co. Sur., pumped 95 bbl., 39 gravity, sand pay 4,114 ft., T.D. 4,351 ft. Discovery.

A. R. Dillard 1 L. W. McCrory trustee "T," Sec. 111, A.T.N.C.L. Sur., dry, T.D. 5,354 ft.

Throckmorton County: Humble Oil & Ref. 2 J. B. Matthews, 660 ft. from N, 1,980 ft. from W, Sec. 55, Comanche Indian Reserve, dry, T.D. 5,314 ft.

Archer County: White & Duncan 1 First State Bank, 200 ft. E and S, Sec. 33, Blk. 5, Clark & Plumb Subd., dry, T.D. 1,201 ft.

White & Duncan 1 L. Kinder 111, 330 ft. from S and E, Lot 111, Blk. 5, Clark & Plumb Subd., dry, T. D. 1,193 ft.

C. C. Winfrey 1 J. N. McGeorge, 330 ft. from S and W, 80-ac. lease, S.A.&M.G. Ry. Sur., dry, T.D. 760 ft.

WEST CENTRAL TEXAS

ABILENE, Tex. — Improvement in the flow from the Canyon sand at Great Lakes Carbon Co. 1 O. H. Hardy, Section 11, Block 4, H.&T.C. Ry. Survey, 7 miles north of Anson, was seen as the well increased its output to 7 bbl. per hour. Original flow was 5 bbl. per hour through 120 perforations from 3,690 to 3,710 ft. This new strike has revived interest in the north part of Jones County, and leasing has been brisk.

Two new wells are to be drilled in Stephens County. Phillips Petroleum Co. 1 Laura Wild has been staked in NE NW Section 58, Blind Asylum land, ½ mile southeast of Ibex pool and 2 miles northwest of Loving pool. Two miles northwest of Ivan, Shell Oil Co., Inc. has staked 1 O. E. Allen, 990 ft. from south and center of east and west lines Section 10, Block 2, S.P.R.R. Survey.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Shackelford County: Kittery Oil 1 Fronia Clausell, 1,163 ft. from SE, 833 ft. from SW, Sec. 587, T.E&L. Sur., dry, T.D. 775 ft.

Stephens County: Frank Buttram 1 R. C. Ritchie, 467 ft. from N, 1,400 ft. from W, Sec. 1,293, T.E&L. Sur., elev. 1,157 ft., Caddo 3,269 ft., dry, T.D. 3,310 ft.

Taylor County: B. & W. Oil 1 W. Norwood, 660 ft. from N, 1,980 ft. from E, Sec. 59, Blind Asylum Land, elev. 1,746 ft., dry, T.D. 3,600 ft.

F. Craig Morton 1 C. M. Caldwell, 350 ft. from N, 330 ft. from W, Sec. 83, Blk. 14, T.&P. Ry. Sur., elev. 1,673 ft., dry, T.D. 1,833 ft.

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MICHIGAN

Reed City Field Allowable Cut to Maintain Pressure

SAGINAW, Mich.—In action representing a compromise, P. J. Hoffmaster, state supervisor of wells, Friday ordered a 20 per cent reduction in maximum allowable production of crude from the Reed City oil field, currently providing more than a third of Michigan's production. His order, effective December 16, limits per-well production to 100 bbl. a day on 20-acre tracts, and to 175 bbl. on 40-acre tracts. Under current proration schedules the allowables have been 125 and 218 bbl. per day, respectively, depending on acreage.

The state board had recommended that production be continued at the current rate after hearing witnesses present conflicting theories. Two University of Michigan petroleum engineers had argued for a 40 per cent cut while engineers for operators in the field contended the field might

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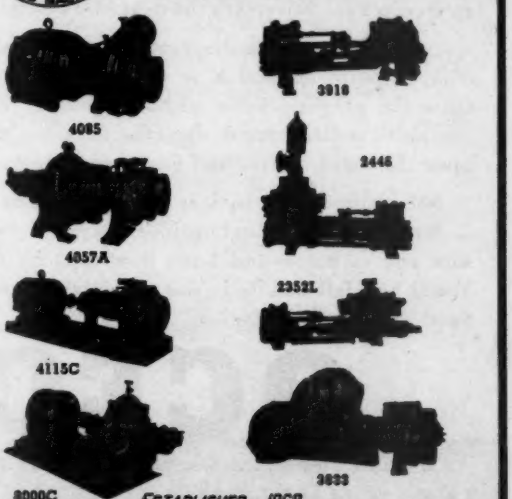

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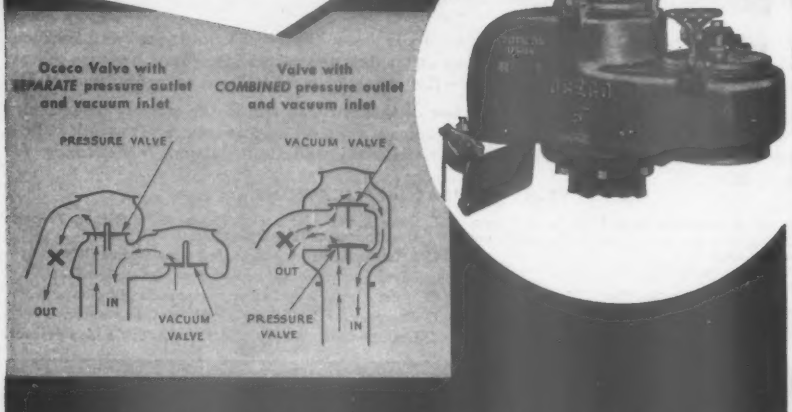

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even benefit by increasing the allowable.

Hoffmaster, in another action, approved and put into immediate effect a recommendation of the advisory board reducing proration in the Goodwell field of Newaygo County from 262½ bbl. a day per 40-acre drilling unit to 150 bbl. He is considering a request of the board, while awaiting completion of tests, whether the Rose Lake field in Osceola County should be designated as a gas field instead of an oil pool because of the high ratio of gas now being produced there.

WILDCAT COMPLETIONS

Allegan County, Leighton Township: Rex Oil & Gas Co. 1 John Spoelstra, et al., SE SE SE 4-4n-11w, dry, T. D. 2,026 ft.

Clare County, Frost Township: Sun Oil Co. 1 James Van Deusen, CN½ NW NW 14-20n-4w, dry, T. D. 1,580 ft.

Kent County, Courtland Township: James J. McGerry, Tr., 1 Wayne A. Whittal, SE SE NW 26-9n-10w, dry, T. D. 3,016 ft.

Lake County, Dover Township: Charles W. Teater 1 E. E. & D. Heyd, CN½ NE NE 35-20n-11w, dry, T. D. 3,797 ft.

Sanilac County, Evergreen Township: L. G. Thompson 1 Charley Hirsch, CE½ SE SE 14-13n-12e, dry, T. D. 2,494 ft.

Van Buren County, Columbia Township: S. L. McCall 1 Leona Griffith, SW SW NE 17-1s-15w, dry, T. D. 1,133 ft.

APPALACHIAN FIELDS

Deep Wildcat Is Abandoned After Losing Tools

PITTSBURGH, Pa. — On Chestnut Ridge in Derry Township, Westmoreland County, Peoples Natural Gas Co. is plugging the deep wildcat on the Camilla Giffin farm after losing tools in a gas pocket at 8,028 ft. The Tully lime was topped at 7,235 ft., deeper than expected. Another lime section was reached at 7,990 ft., which was of much the same appearance, suggesting a repetition due to a low angle fault encountered around 5,300 ft. As this appeared outside of probable producing limits, the test was abandoned.

WEST VIRGINIA

Tucker County.—The deep wildcat of the Ohio Oil Co. on the Kaemmerling tract on the Blackwater anticline in Dry Fork district, Tucker County, cleaned out the wire on the tools lost at 7,979 ft. to the rope socket where the combination failed to grip due to a piece of cable. When an attempt was made to mill off the wire a gas pressure or pocket blew the second string up the hole and an attempt is being made to whip the line off. From studies of the samples, it is believed that the tools lost are in the Oriskany caprock. There is a gas volume of 150,000 cu. ft. which has not diminished.

Kanawha County.—In Poco district, United Fuel Gas Co. struck a

good gas well in the Big lime in its 5,325 A. E. Melton. It has a gage of 7,117,000 cu. ft. with the Big lime topped at 1,677 ft.; gas 1,700-08 ft., total depth.

Wyoming County.—In Center district, United Producing Co. struck a fair pay in the Big lime in 4 W. M. Ritter Lumber Co., with the top of the Big lime 2,565 ft.; 169,000 cu. ft. gas at 2,300 ft. and 650,000 cu. ft. gas at 2,750 ft. Drilling is continuing.

LOUISIANA GULF

Drill-Stem Test Recovers Oil at Arnaudville Well

NEW ORLEANS, La.—A new oil field seemed in prospect in the Arnaudville area of north St. Martin Parish, as Amerada Petroleum Corp. ran a second test in the 1 Bertinot-Quebedeaux unit, 44-8s-5e, west-southwest of Arnaudville townsite. Details of the second test were not available at this writing. On first test, in perforations at 10,386-90 ft., drill-stem test had recovered 18 bbl. of oil and 154 bbl. water, using 5/32-in. choke. These perforations were squeezed off in favor of a new set of holes for a second test. Total depth is 10,700 ft.

E. R. Brann and North American Consolidated Oil Co. are completing the 2-A Edgewood Land & Lumber Co., 30-7s-10w, north of the 1-A Edgewood oil discovery well at Perkins, Calcasieu Parish, as a gas well. It is completing in perforations at 5,352-66 ft. The well is estimated good for some 20,000,000 cu. ft. of gas a day and market for some of the gas has been secured. Several tests were made a little deeper in the 5,300-ft. sand in an effort to complete as an oil well before decision was reached to complete as a gasser. Total depth is 5,429 ft.

Danciger Oil & Gas Co., H. J. Wier and W. D. Haas, Jr. 1 Hattie Haas, 22-4s-1w, codiscovery well of the Reddell field in Evangeline Parish, was completed in the Tate sand, through perforations at 9,905-11 ft. and 9,914-55 ft., flowing 358 bbl. a day.

Vermilion Parish.—Pure Oil Co. is completing its 14 Alliance Trust Co., 33-11s-1w, southwest extension test on southwest flank of the Gueydan field. On first test, while cleaning, it made 101 bbl. in 8 hours on 10/64-in. choke, 35.6-gravity oil, from perforations at 9,708-22 ft. and 9,730-46 ft. Total depth is 10,075 ft.

LOUISIANA GULF COAST WILDCAT COMPLETIONS

Acadia Parish: Sun and Continental 2 Homeseekers Dev., Sec. 54-10s-1w, at Estherwood, dry at 11,962 ft., shale.

Evangeline Parish: Danciger O. & R. Co., H. J. Wier and W. D. Haas, Jr. 1 Hattie Haas, Sec. 22-4s-1w, at Reddell. 1¼

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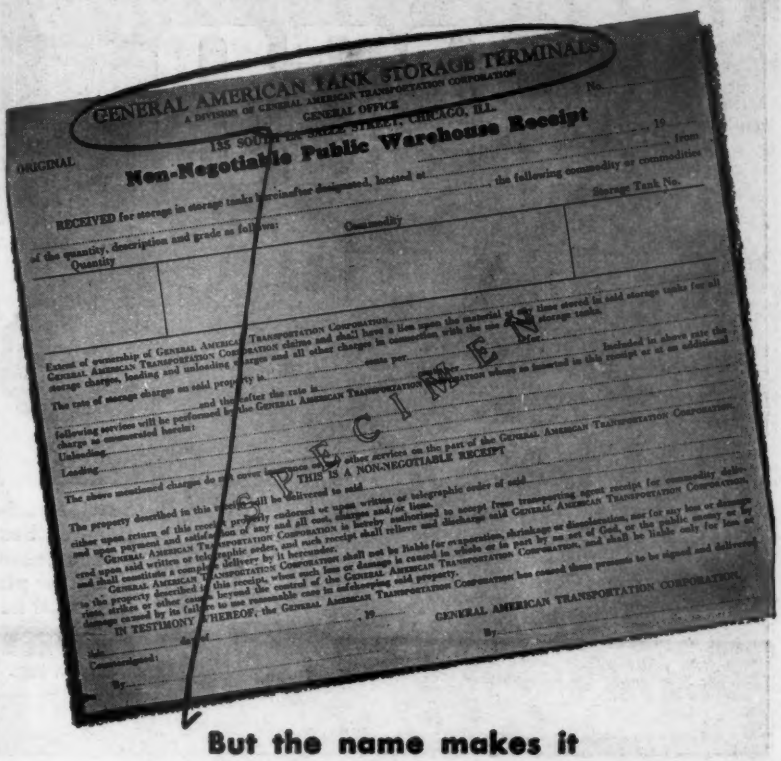
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mi. E of Continental-Humble 3 Pardee discovery well, T.D. 12,206 ft., 6-in. 12,196 ft., top Vicks. 7,735 ft., Sparta lime 9,815 ft., Pine Prairie Cockfield sand show S.W. 8,867 to 8,928 ft., Sparta (Ville Platte) sands, Haas show gas-cond. 9,718-31 ft., Tate show gas-cond. 9,881 to 9,955 ft., top Wilcox 10,494 ft. Perforated 156/9,914-55 ft. and 36/9,905-11 ft., completed 11-20-43, P.T. 358 bbl. day, ¼-in. choke, T.P. 2,800 lb., casing sealed, gravity 58.2, no water, 2-in. set 9,878 ft., packer 9,862 ft.

ROCKY MOUNTAIN

Oil Increases at New Tensleep Discovery

DENVER, Colo. — Little Buffalo Basin, Park County, Wyo., is now definitely classed as a discovery in the Tensleep as a result of improved conditions in Fred Goodstein 1 Pedley-Government, NE NE NW 13-47n-100w, the first test to reach that horizon. In the latest test it swabbed 15 bbl. an hour and is expected to improve. While agitation has not yet caused it to flow, it looks as though it will be a large pumper. In the first test it swabbed 7 bbl. an hour and the fluid was lowered to 2,100 ft. After standing 8 hours it filled to within 1,660 ft. of the top. It then was swabbed down 4,730 ft., was shut in for 2 hours, and filled up to 4,400 ft. The next step will be to wash the walls with acid and shoot. The total depth is 4,965 ft., the 7-in. is at 4,787 ft. Ground elevation 5,915 ft. Tops are as follows: Frontier, 1,205 ft.; Dakota, 2,560; Lakota, 2,910; Sundance, 3,115; red beds, 3,435; Embar, 4,620; Tensleep, 4,785. The same hole had a gas discovery in the Lakota on the way down. It was not tested, but is estimated at 10,000,000 to 15,000,000 cu. ft.

Little Buffalo Basin lies 60 miles south of the Elk Basin field and midway between the two is the large Oregon Basin field. The structure consists of two highs known as the east dome and the west dome. The east dome has an independent closure of about 500 ft. as shown on the U. S. Geological Survey map, and the west down 400 ft., with a total closure around the two highs of about 2,000 ft. Apparently it is not a faulted structure. It has a flat oval area approximately 4 miles wide and 7 miles long and is almost surrounded by an escarpment of the Mesa Verde 400 to 500 ft. high. The approximate area of the east dome within the independent closure is 2,400 acres, and of the west dome, 1,800 acres, with a total of about 7,600 acres within the total closure.

The Goodstein well is in the east dome, about 400 ft. down from the apex and on the lowest contour of the independent closure. The oil tests 20.7° gravity. The Stanolind test 3½ miles to the northwest is on the west dome and near the top. It has not yet reached the objective. The field has been producing gas from the Frontier since 1914. Similar to Elk Basin, it is now apparent that the Tensleep will be productive far out beyond the area of the gas production in the Frontier.

Sky-high bids for Elk Basin leases. Bids for leases on 75.64 acres of government land in the Elk Basin field, all on the Montana side, opened by the secretary of the interior on November 29 at Washington, revealed some unusual results. The bids aggregated $615,500, or an average of $8,139.38 an acre. The highest bid was $26,216 an acre submitted by Stanolind Oil & Gas Co. for 1.11 acres.

Water in Madison at Frannie.—The Madison lime as a potential producing horizon in the Frannie field was discounted in Stanolind Oil & Gas Co. 16-X Rosenberg, which found water in that stratum and is plugging back. Location is ¼ mile northwest of 36 Rosenberg, drilled to the Madison in 1929, which made 2,424 bbl. in 24 hours and subsequently went to water.

WYOMING WILDCAT COMPLETIONS

South Baxter Basin, Sweetwater County: Mountain Fuel Supply Co. 1 Unit, NE SW NE 21-16n-104w, T.D. 7,172 ft., tested Tensleep, P.B. to 2,960 ft. and completd in Dakota, top at 2,850 ft., for 5,000,000 cu. ft. per day.

MONTANA WILDCAT COMPLETION

Pondera Block, Pondera County: Northern Ordnance, Inc. 1 Pitcairn, C NW SE 27-28n-8w, T.D. 5,050 ft. in Madison lime, 7-in. 4,842 ft., P.B. to 4,856 ft., acid, without results, pulling pipe to abandon.

CANADIAN FIELDS

East Flank of Turner Has Second Deep Test

CHATHAM, Ont. — North Turner Valley developed another 10,000-ft. test which may ultimately rival the Jumping Pound well, when Foothills Oil & Gas 13, LSD 15, 27-20-3w5 passed 10,008 ft. in Fernie shale formation. Foothills 13 got the Home sand at 9,600 ft., Kootenay formation at 9,800 ft. and the Fernie contact at 9,936 ft., with the producing horizon looked for in the Madison limestone, around 10,500 ft.

In the west-central and southwest sections, three marginal wells, sponsored by Wartime Oils, have encountered the Madison limestone, and should test production within a couple of weeks. Pacific Petroleum 6, LSD 5, 7-19-2w5, got the lime at 8,109 ft. and Okalta 15, LSD 10, 6-19-2w5, got the lime at 7,725 ft. Farther south, Okalta 12, LSD 15, 24-18-3w5, is nearing completion after hitting the Madison high at 7,202 ft. Large production in any of these wells would encourage new development.

Jumping Pound. — Shell Exploration-Norman 1, LSD 5, 22-24-5w5, on the Jumping Pound structure west of Calgary, bottomed in Madison limestone at 12,056 ft., got about 25 bbl. of salt water and a small showing of gas. Test was not considered wholly reliable, and a retest of the lower porous zone will be made before testing several horizons higher in the hole.

Nova Scotia.—L. B. Currie, minister of mines for the province of Nova Scotia, has announced that, following extensive preliminary investigations, drilling for oil will be undertaken in three counties of Nova Scotia within the next few months. Several companies are preparing to start active work in the spring.

TEXAS GULF COAST

Extension and New Gas Field Mark Active Week

HOUSTON, Tex. — General Crude Oil Co. is preparing to complete its 1 John Barber et al, Meredith Duncan Survey, north extension test at the Kirby field on southwest flank of the Esperson dome in Liberty County. On one preliminary gage the well flowed 65 bbl. in 24 hours through ⅛-in. choke. Completion is being effected in perforations at 7,080 to 7,100 ft. and at 7,110-40 ft. Total depth is 9,723 ft.

A new gas field was opened 5½ miles northwest of Louise in Wharton County by Salt Dome Oil Corp. at the 1 A. G. Menefee et al in S. P. Middleton Survey A-269. With total depth of 4,600 ft. 5½-in. set on bottom, perforations were made at 4,540-50 ft. and the well gaged 2,425,000 cu. ft. of gas daily on ¼-in. choke, tubing pressure 1,635 lb. flowing, shut-in tubing pressure 1,840 lb. The company is having rig moved to the 2 A. G. Menefee et al, about half a mile northwest of the discovery well.

Humble Oil & Refining Co.'s wildcat at Rattlesnake Mound, Brazoria County, the 3 Houston Farms Development Co., Alfred Swingle Survey A-369, has proven disappointing on several tests in deep sands and it is doubtful if a commercial producer can be completed. Last test was in perforations above plugged-back depth of 11,000 ft. and the well flowed 221 bbl. salt water with 6 bbl. of condensate on ⅜-in. choke on tubing and ⅛-in. choke on flow line, tubing pressure 4,700 lb. Total depth is 11,700 ft.

Pan American Producing Co. is preparing to test a higher sand in the 1 Austin College, closely watched

wildcat on southwest flank at Raccoon Bend in Austin County, William C. Harvey Survey. First test, in perforations 7,634-36 ft. had recovered fresh and brackish water, no oil shows, and the second test, in perforations at 7,520-44 ft. had swabbed salt water after failing to show anything on drill-stem test. Total depth is 9,515 ft. Top of the Wilcox is at 7,300 ft.

Of extreme interest to operators in the Gulf Coast district is the announcement by Atlantic Refining Co. of location for a deep Wilcox test on east flank of the Conroe field. The old Conroe field, which has produced for some 13 years from the Cockfield, long has been regarded as a favorable spot for deep Wilcox production. However, very little prospecting to the deeper level has been done, deep tests having been drilled only on one flank of the dome. Atlantic's new test is the 1 South Texas Development Co., 620 ft. from south and west lines of a 40-acre unit, being in extreme northwest corner of Lot 66, Security Subdivision 4, Clark Beach Survey. The company proposes to drill to 12,000 ft.

TEXAS UPPER GULF COAST WILDCAT COMPLETIONS

Colorado County: Shell Oil Co., Inc. 1 Ella B. Thompson est., Mustang Creek area, 1½ mi. N of Garwood townsite, abandoned at 11,525 ft. Drill-stem test 9,699 to 9,755 ft. flowed 29 bbl. 43.3 gravity cond. and 109 bbl. S.W. day, ¼-in. choke, 1,710,000 cu. ft. gas, T.P. 1,450 lb., C.P. 2,000 lb., and drill-stem test 9,700-33 ft. flowed 24 bbl. cond. and 98 bl. S.W. day, ⅜-in. choke, W.P. 1,000 lb.

Wharton County: Salt Dome Oil Corp. 1 A. G. Menefee et al, 5½ mi. NW of Louise, gas discovery well, completed 11-29-43, T.D. 4,600 ft., perf. 4,540-50 ft., P.T. 2,425,000 cu. ft. gas day, ¼-in. choke, T.P. 1,635 lb. flowing, shut-in T.P. 1,840 lb., 5½-in. 4,600 ft.

ILLINOIS

Bungay Pool has Largest New Well of the Week

MATTOON, Ill.—Nineteen completed oil wells and 16 dry holes comprised the record of the week in the Illinois fields.

Fred A. Noah opened a new producing spot near the Albion field in Edwards County with 1 Edwards County Poor Farm, NE SW NW 6-2s-11e, which made 41 bbl. of oil and 10 bbl. of water in 24 hours on the pump from Lower O'Hara (Levias lime) pay at 3,102-08 ft. Total depth 3,166 ft.

The largest initial producer of the week was National Associated Petroleum Co. 1 Hawthorne, NE NE NE 34-4s-7e, in the Bungay pool in Hamilton County. It flowed 488 bbl. the first day from Aux Vases sand at 3,296-3,314 ft. total depth, but fell off to 288 bbl. the following day. It had not been shot.

Another god well was Pure Oil Co. 1 H. Michels, NE SW SW 25-2n-7e, Clay City field Wayne County, which pumped 349 bbl. per day from Aux Vases sand at 2,917-40 ft. It had not been shot.

A 280 bbl. well in the Friendsville pool, Wabash County, Shell Oil Co., Inc., 1 Thorpp-Dougherty, SW NW NW 29-1n-12w, producing from Cypress sand at 2,029-41 ft. total depth 2,370 ft.

Other completions were below average in initial output.

A seventh pay in the Phillipstown pool in White County was uncovered by Jarvis Bros. & Marcel 12 E. Spencer, near CE½ NE SW 31-4s-11e. McClosky lime was found at 3,007-11 ft., which when acidized yielded a production of 350 bbl. per day. It was not yet completed.

In the Clay City Consolidated field in Wayne County, Pure Oil Co. 1 Van Fossan-Brown, C SE SW 14-1n-8e, Elm River Township, was reported to have flowed 1,200 bbl. in 24 hours through casing after the tubing had been blown out of the hole. It produces from McClosky lime at 3,047-60 ft. It was reported completed the previous week with a production of 204 bbl. on the pump.

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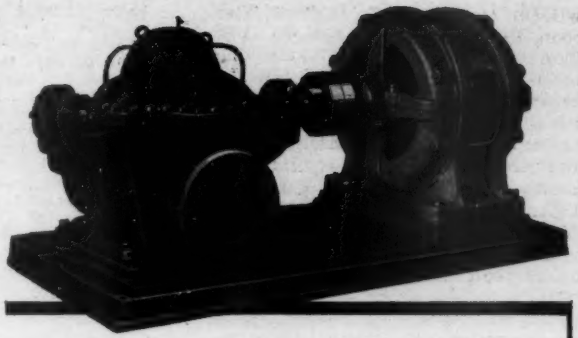

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ported of which only six were wildcats, which follow: Texas Co. 1 S. Stokes, SW NW NW 7-8n-1e, and Paul Doran 1 Mabry-White, NE NW NE 9-6n-1e, Fayette County; Alexander Fruit Co. 1 Wright, W½ NE SW 34-5s-5e, and Biggs & Johnson 1 W. T. Barr, NE NE NE 26-4s-5e, Hamilton County; Southwest Illinois Coal Corp 1 Cleland, NE SE NW 25-5s-5w, Randolph County, and G. H. Schrock et al 1 L. Johnson, N½ NE SW 29-8n-8e, Jasper County.

ILLINOIS WILDCAT COMPLETIONS

Bond County: F. M. Conry 1 Foreman, SE SW SW 18-4n-3w, dry at 1,090 ft., Benoist sand top 1,025 ft.

Edwards County: Fred A. Noah 1 Edwards County Poor Farm, NE SW NW 6-2s-11e, pumped 41 bbl. oil, 10 bbl. water, Levias lime 3,102-08 ft., T.D. 3,166 ft.

Franklin County: Bell & Zoller 3 Ziegler Coal & Coke Co., SE SW SW 23-7s-1e, dry at 2,868 ft., McClosky lime 2,853-67 ft.

J. V. Canterbury 1 Sara Webb, NW SW SW 4-5s-4e, dry at 3,319 ft., Menard 2,321 ft., Cypress 2,818 ft., Aux Vases 3,086 ft., McClosky 3,228-34 ft.

N. V. Duncan 1 Franklin County Coal Co., NW NW SW 5-5s-3e, dry at 3,092 ft., Kinkaid 1,839 ft., Cypress 2,564 ft., Benoist 2,788 ft., Aux Vases 2,838 ft., St. Louis 3,079 ft.

Jefferson County: J. M. Horsch 1 C. E. Fuller, SW NE NE 1-2s-1e, dry at 2,081½ ft.

Magnolia 1 Knox-Gec, NE SE NE 7-3s-3e, dry at 2,806 ft., Aux Vases 2,671-67 ft. and 2,683-93 ft.

Lawrence County: J. S. Dow 1 A. D. Boeuf, C E½ E½ E½ 18-2n-11w, dry at 2,300 ft., Rosiclaire 1,952-63 ft.

Marion County: Jarvis et al 1 F. Gabriel, NW NW SE 28-3n-3e, dry at 2,493 ft., Menard 1,704 ft., Cypress 2,134 ft., Benoist 2,277 ft., Aux Vases 2,357 ft., Ste. Genevieve 2,394 ft.

Richland County: Clark Hill and Pana Refining 1 Tarpley, E½ NE NW 22-2n-14w, dry at 3,110 ft., McClosky 3,045-49 ft., acidized.

St. Clair County: C. W. Young 2 McCurdy, NW SW SW 29-3s-6w, dry at 629 ft.

Washington County: R. A. Pogerson 1 Shubert, SW NW NW 18-3s-4w, dry at 1,705 ft., upper Glen Dean 800 ft., Benoist 1,157 ft., Aux Vases 1,213 ft., St. Louis 1,380 ft.

Wayne County: Roy Powers 1 Murphy, NW NW NW 18-1n-6e, dry at 3,147 ft., upper Kinkaid 1,950 ft., Cypress 2,680 ft., Benoist 2,879 ft., Aux Vases 2,945 ft., Fredonia 3,052 ft.

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MISSISSIPPI

Upper Wilcox Has Salt Water in Cranfield Test

JACKSON, Miss. — The California Co. is preparing to run a new test in the 1 Ella G. Lees, Section 52-7n-1w, at Cranfield in Adams County. Perforations at 4,371-79 ft. flowed oil and wash water into pits through 9/64-in. choke, no gage, and later showed from 20 to 60 per cent salt water. This test was in one of the upper Wilcox sands, topped at 4,102 ft. Total depth is 5,887 ft.

Carter Oil Co. 1 O. H. Billingslea, wildcat in NE SW 30-11n-4e, Madison County, is bottomed at 6,748 ft., ran electric log and took sidewall samples and is shut down now for orders. It topped the Tuscaloose at 5,724 ft., Marine Tuscaloosa 6,146 ft., Massive sand 6,402 ft. and the Lower Cretaceous at 6,630 ft.

MISSISSIPPI WILDCAT COMPLETIONS

Neshoba County: Southern Natural Gas Co. 1 S. B. Smith, ctr. SE¼ NE ¼ Sec. 1-9n-11e, dry at 6,875 ft., after running electric log.

FLORIDA

Humble Oil & Refining Co. is preparing to move in rig to its second test in the Suniland area of Collier County, in southern Florida. The new test is 2 Gulf Coast Realty Co., center of SW SE 30-48s-30e, being a mile west of the 1 Gulf Coast discovery well. Rig from the pumper will be used to drill the new test.

Humble 1 Gulf Coast Realties Co., 29-48s-30e, discovery well of the Suniland field, was put on the pump and made 400 bbl. of fluid a day, about 30 to 40 per cent low-gravity oil, balance emulsion and water. It was pumping into heaters with enough gas coming from the hole to fire the heaters. This production is from lime at 11,613-26 ft.

SOUTHWEST TEXAS

Pettus Production Extended East of Bridwell Field

CORPUS CHRISTI, Tex. — A new Southwest Texas oil field has been opened by Pan American Producing Co. near the old Thomas-Lockhart field in northeastern Duval County, 2 miles east of the Bridwell field, on 82.71-acre "B" lease in GH&H survey No. 115. With total depth at 4,727 ft., 5½-in. casing set to 4,725 ft., perforations were made in the Pettus sand at 4,671-80 ft. On drill-stem test it flowed 4 bbl. of 43-gravity oil per hour on ¼-in. choke. Tool was pulled and tubing set in the hole for completion and on preliminary test it flowed 96 bbl. a day through 3/16-in. choke with low gas-oil ratio.

Bee County.—Pure Oil Co. 1 Tom May, extension test 3,700 ft. southwest of the 1 Williams oil discovery at Blanconia field, flowed 75 bbl. of 28-gravity oil a day while cleaning; flowing 8 hours on 5/32-in. choke and 16 hours on ⅛-in. choke. It is flowing from perforations in the Vicksburg sand topped at 4,950 ft.; Vicksburg showing gas at 4,950-61 ft. and oil at 4,961-67 ft.

Goliad County.—Fred W. Shield 1 Etta Terrell, 4 miles southeast of Fannin and east of the Fannin gas field, recovered only salt water on drill-stem test in perforations 4,762-67 ft. in top of the Vicksburg sand. Sidewall samples had indicated shows in the Vicksburg and also in the Frio horizon. New perforations were made for a test in the Frio section. Total depth is 5,203 ft.

Jim Hogg County.—The Texas Co. is preparing to try again in the Armstrong field area, staking location for 2 Royal R. Yaeger northwest of the Armstrong field discovery well. It is at 5,000-ft. test, 1,320 ft. from east and 330 ft. from north lines of R. Garza survey No. 222, on 1,100-acre lease, and only 990 ft. west of the 1 Yaeger dry hole, drilled recently about 9,000 ft. northwest of the discovery well.

SOUTH TEXAS WILDCAT COMPLETIONS

Duval County: Argo Oil Corp. 2 Frank Braslau et al, 3½ mi. S SE of Tarancahuas field, 10 mi. N NW of Benavides townsite, dry at 5,202 ft., no shows.

Jim Hogg County: Texas Co. 1 Royal R. Yaeger, 7½ mi. SW of Hebbronville and about 8,500 ft. NW of Armstrong field discovery well, dry at 3,895 ft.

LOWER GULF COAST WILDCAT COMPLETIONS

San Patricio County: E. A. Graham 1 J. R. Barry est., 3 mi. east of Gregory, dry at 7,506 ft.

Bee County: Transwestern Oil Co. and H. B. Zachry Co. 1 Holzmark est., 2½ mi. south of Mineral, between old Shallow Voss and Foley fields, temporarily abandoned at 8,919 ft. after showing gas, condensate and salt water in perforations 8,300-10 ft. It also had

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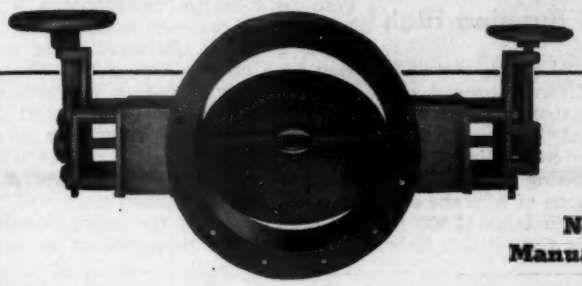

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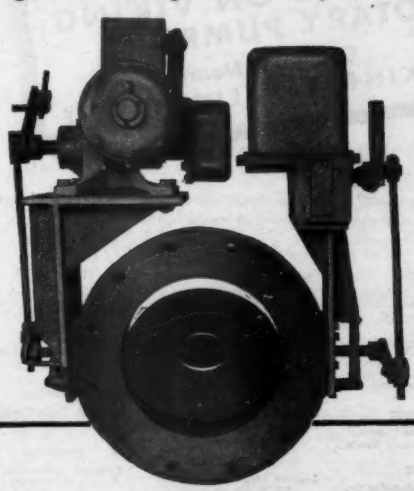

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shown gas in perforations 8,668-83 ft., gas condensate and salt water in perforations 8,530-40 ft. and gas and salt water at 8,735-40 ft.

Jim Wells County: H. F. Wilcox Oil & Gas Co. 2 Elizabeth Almond Price, 4 mi. W NW of Alfred, about 3 mi. westerly from Alfred field, dry at 5,260 ft.

SOUTH CENTRAL TEXAS WILDCAT COMPLETIONS

Gonzales County: G. W. Strake 1 H. K. Weber, 4 mi. SE of Nixon, on Shell farmout, dry at 4,808 ft., no shows.

Milam County: L. Underwood Rowntree 1 S. D. Yoakum, 3 mi. NE of Rockdale, dry at 4,218 ft. in Edwards lime.

Wilson County: L. D. Ormsby 1 V. S. Riley, 7 mi. NE of Floresville, dry at 5,210 ft. in Edwards lime.

CALIFORNIA

Southeast Extension to Greeley Field Running High

LOS ANGELES, Calif. — Standard Oil Co. of California proved existence of a new structural high at the southeast end of the Greeley field in Kern County by completing 1 Wegis Community, flowing 350 bbl. daily from the Vedder zone of Miocene age with bottom of the hole at 11,600 ft. The Vedder sand in the Greeley field has been found highly prolific. The new structural high, however, may be limited to about 300 acres and on the basis of 35,000 bbl. per acre would represent about 10,000,000 bbl. ultimate. The Greeley field contains several structural highs or domes and the Wegis outpost is believed to have proved up the existence of another, south of previous production. Standard would probably have secured a much larger flow if mechanical trouble had not developed, necessitating a redrilling job. Union Oil Co. has failed to develop commercial production in its wildcat west of the Rio Bravo field and has abandoned the hole. This was a joint test with several other operators and for this reason another well may be drilled to the west and south.

Dwight Vedder has reentered his discovery well in the West Mount Poso field in the San Joaquin Valley and has resumed drilling. He intends to drill additional hole and then case off the top of the Vedder sand in order to reduce gas production. This wildcat was brought in late last week and showed a daily flow of 4,000,000 cu. ft. of gas with a spray of condensate, an unusual condition for a Vedder sand well in the eastern rim of the valley. Vedder had completed preparations to drill a second well west of the discovery but was refused an exception on the basis that the discovery well was a gasser.

R. S. Lytle's well in the Pleasant Valley field flowed for 3 hours at a daily rate of 2,000 bbl. after cement was drilled out 5 ft.

California is expected to have another new gas field within the next few days as General Petroleum Corp. is preparing to complete 1 Capital near Colusa in Colusa County west of the Marysville Buttes gas field. Shell Oil Co., Inc. is expected to extend the Mendota gas field about 1 mile northwest as its 38-18 Gill, which showed 13,000,000 cu. ft. of dry gas on a formation test a few weeks ago from 4,417-71 ft. The well is being prepared for production.

The large flow shown by Federal Oil Co. 4 Smith at the north top of the Inglewood field still interests operators as it has been a long time since a 2,000-bbl. flowing well has been completed in Southern California. Completion of this well may result in additional drilling within the corporate limits of Culver City, although it will be necessary to modify drilling restrictions. W. E. Steve Dunlap is responsible for development in the northern Inglewood field as he was doing the engineering work for Federal when work was started.

Jones sand development is still under way at Huntington Beach and is being deflected by completion of good flowing wells. Ford zone development is just getting under way at Wilmington and this field, where 51 new wells have been completed, has given a good account of itself during the first 11 months of 1943. Enough locations have been staked in this field to sustain activity for several months and the only thing that is delaying drilling operations is the shortage of crews.

In the coastal district, operators are watching the outcome of work on Standard of California 2-1 Fillmore Community in Ventura County, which is reported to have found something interesting. This is not definitely confirmed by operators. Casing has been landed. Los Nietos Oil Co. is preparing to drill out the cement in 1 Scott which found some oil sand in the Arroyo Grande district of San Luis Obispo County and an early test will be made. A new field in this area would result in considerable drilling and the outlook is promising.

CALIFORNIA WILDCAT COMPLETIONS

East Coalinga wildcat district, Fresno County: Wilshire Oil Co. 1 Imperial, 34-18s-15e, abandoned in barren gray sand, T.D. 2,250 ft., bottomed in Eocene, no oil or gas showings logged.

Rio Bravo wildcat district, Kern County: Union 81-8 Kernco, 8-29s-25e, abandoned as not productive, T.D. 10,165 ft., Stevens sand of Miocene age missing, form. test 9,600 to 9,711 ft. wet, form. test 5,811-53 ft. wet.

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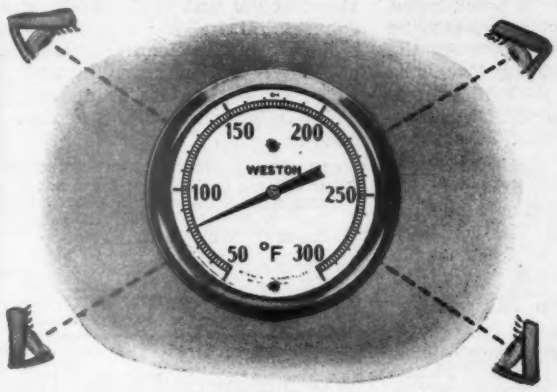

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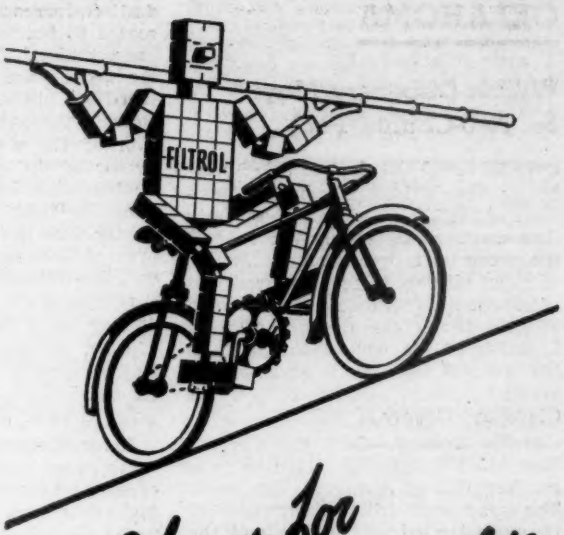

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OKLAHOMA

Wilcox Discovery May Be Two-County Pool

STANOLIND OIL & GAS CO.'S prospective Wilcox discovery northwest of McComb and near the county line was running casing the first of the week after recovering 1,000 ft. of oil-cut mud and water in the sand at 6,237-47 ft. Total depth is 6,251 ft. Location of the well, 1 Rosebush in SW SW SW 19-8n-2e, is on a seismograph high that is said to extend into Cleveland County.

Noble County.—Gulf Oil Corp. 1 Juanita, NE NE NE 1-21n-1e, was another Wilcox discovery last week. The sand was drilled from 4,590-97 ft., pipe landed at the top and the well flowed some 20 bbl. of oil in 1 hour. Further production tests will be made when tanks are erected. Location is about 6 miles southwest of the Liberty one-well Wilcox pool. Gulf also had two other discoveries completing. The 1 Hopkins in 8-8n-20w, Washita County, which originally produced some 15 bbl. of oil an hour in granite wash at 5,542 ft., but was carried on to 9,971 ft., plugged back to 6,591 ft. A second pay section in the granite wash at 6,425-6,591 ft. increased the flow to an estimated 60 bbl. of oil an hour through open tubing. The well was shut in the latter part of last week after it filled 900 bbl. of storage in 22 hours, flowing through ½-in. chokes. Location of the well, in the southwest corner of the county, appears to be another link in the fields along the Amarillo uplift extending from the Carter County fields to the Sayre gas area of Beckham County, Oklahoma, and the Amarillo field of Texas.

In Logan County, Gulf was completing its 1 Prichard, NW NW 22-17n-3w, for an approximate 100-bbl. Layton sand producer. The well tested the Wilcox sand at 6,333 ft. but plugged back to 4,770 ft.

Greer County.—The only wildcat completion reported for last week opened a new shallow gas pool. E. K. McLennon and R. C. Moss 1 Nelson found the gas sand at 625-30 ft., where it previously blew out and burned the rig, and was completed at 671 ft. Location of the new well is 6 miles northeast of the town of Mangum, on the west end of the Wichita uplift. A number of wells have been drilled in this general area over the past several years, some of which found oil and gas shows as low as 1,500 ft. Consolidated Gas Co. was reported to be making connection to the well. The same operators were moving in at the 1 Briggs, SW SW NW 31-6n-21w, for a second shallow well, after which a 2,500-ft. proposed granite test will get under way.

McClain County.—Carter Oil Co.'s two wildcats which have attracted considerable attention were drilling ahead at the first of the week. The 1 Johnson Ranch, SW NE 13-8n-4w, had a show of oil in Pennsylvanian sand at 8,725 ft. and was drilling at 8,754 ft. in shale. The 1 Cottingham, SE SW 4-7n-3w, was drilling in lime at 9,968 ft.

OKLAHOMA WILDCAT COMPLETION

Greer County, 6 mi. NE of Mangum: E. K. McLennan 1 Nelson, SE SE SW 30-6n-21w, flowed 800,000 cu. ft. gas, sand 625-30 ft., T.D. 771 ft.

OHIO, KENTUCKY

Wellington and Other Gas Areas Are Extended

ZANESVILLE, Ohio.—Two good gas wells were completed on outside locations on the north side of the Wellington pool in Penfield Township, Lorain County. Glen Harmon's 2 Homer Sooy shut in at 5,580,000 cu. ft. with a rock pressure of 1,105 lb. and Ohio Fuel's 2 Julia Gates was shut in at 986,000 cu. ft. Six strings are now running in the pool.

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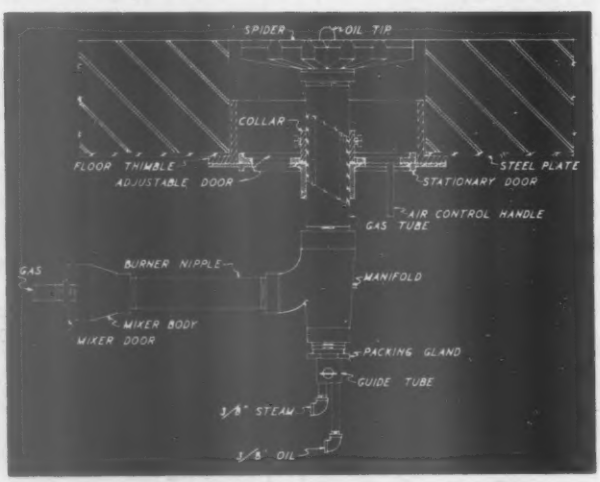

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County was extended ½ mile to the north by the E. Marcum well in Section 19, Symmes Township, completed by The Ohio Fuel. This well makes acreage to the north look favorable and additional locations will be made. The Clinton sand was found at 3,162-76 and gaged 1,510,000 cu. ft.

A good well was completed by Industrial Gas Corp. on the Chas. Miller tract in Section 2, Wayne Township, Muskingum County. The well gaged 3,300,000 cu. ft. from the Clinton sand found at 3,872-3,936 ft. Five additional wells are now drilling in the pool.

A 52-bbl. oil well was completed in the Clayton pool by Wherle Co. on the Adrian tract in Section 4.

WILDCATS

Mahoning County, Springfield Township: East Ohio 1 J. Braunstein, Sec. 16, Clinton, 5,915-47 ft., dry, T. D. 6,059 ft.

Morgan County, Deerfield Township: Ohio Fuel 1 A. F. Hivnor, Sec. 15, Clinton, 4,194-4,228 ft., dry, T. D. 4,316 ft.

INDIANA

EVANSVILLE, Ind. — Three dry holes and a 40-bbl. well were the results of drilling operations in Indiana in the past week. Carter Oil Co. 1 Skiles, NW SE NE 15-8s-15w (10e), 5 miles southeast of New Haven, Ill., but in Posey County, Indiana, found paying production in Tar Springs sand at 2,031-58 ft. but was testing Aux Vases sand. If a success it would extend the East Inman pool, which was opened and developed on the Illinois side of the state line.

WESTERN KENTUCKY

OWENSBORO, Ky.—Carter Oil Co. 1 Kate Austin, a wildcat in Union County, 5 miles northeast of Morganfield, in Union County, opened a pool. Producing from Levias lime at 2,532-36 ft. and McClosky lime at 2,559-67 ft., it pumped 282 bbl. in 24 hours, following acid treatment. Other new producers reported were in established fields and were of a routine character.

WESTERN KENTUCKY WILDCAT COMPLETIONS

Hopkins County: Sohio, Basin Drlg. and Evans 1 Bell-Gatton, 1 mi. NW of Ashelbury, dry at 3,374 ft.

Henderson County: Delta and A. L. Cochran 3 A. H. Mann, 3½ mi. N of Henderson, dry at 2,160 ft. Barlow lime, 2,053 ft., Cypress sand 2,095 ft.

Union County: Carter Oil 1 Kate Austin, 5 mi. NE of Morganfield, pumped 282 bbl. Levias lime at 2,532-36 ft., McClosky lime 2,559-67 ft., T.D. 2,576 ft.

EASTERN KENTUCKY

ASHLAND, Ky.—A month-end report of natural-gas activities in eastern Kentucky shows 18 wells completed with total open flow of 13,417,000 cu. ft. per day.

Eight wells were completed in Pike County with a total initial output of 9,618,000 cu. ft. of gas; three wells in Martin County produced 2,508,000 cu. ft.; two wells in Magoffin County produced 785,000 cu. ft., and two wells in Floyd County made a record of 506,000 cu. ft.

KANSAS

Three Discoveries Are Ready for Completion

SOHIO OIL CO.'s Ness County discovery was showing for a good well after shutting off water coming from the bottom of the hole. The 1 Freville, SE SE 22-16-25w, topped Mississippi lime at 4,528 ft. and was drilled to 4,562 ft. There was 1,000 ft. of oil in the hole but when plug was drilled the bailer recovered considerable water. It was plugged back to 4,550 ft., acidized, and swabbed 20 bbl. of oil an hour, 300 ft. off bottom. Location of the new well is just west of the town of Arnold and some 10 miles north of the Aldrich pool.

Barton County. — Cities Service 1 Eveleigh, NE NE SE 1-18-14w, west of the Barton arch, was given a temporary potential of 434 bbl. of oil a day after pumping 165 bbl. in 13 hours in conglomerate topped at 3,299 ft. Total depth was 3,337 ft. Last perforations at 3,306-18 ft. put 2,800 ft. of 36-gravity oil in the hole in 3 hours.

Barber County. — Deep Rock Oil Corp. 2 Skinner, SW NW NE 29-31-14w, 6 miles southwest of the Sun City pool, was showing some improvement after a second acid treatment in the Viola lime at 4,624-40 ft. The well had previously made 20 bbl. of oil a day but with an additional treatment production rose to 50 bbl., on the swab, in 4 hours.

KANSAS WILDCAT COMPLETIONS

Clark County: Olson Oil 1 Central Life, SW NE 23-32-24w, dry, T.D. 7,063 ft., Viola 6,590 ft., Arbuckle 6,900 ft.

Cowley County: Northern Ordnance 1 Thompson, NW NW SW 21-33-5e, dry, T.D. 3,674 ft., Mississippi lime 3,231 ft., Arbuckle 3,669 ft.

Leavenworth County: Charles Miller 1 Barnhardt, NE NE SW 25-9-21e, dry, T.D. 1,446 ft., Mississippi lime 1,277 ft.

Rice County: National Assoc. Pet. 1 Turner, SE NW NW 16-18-8w, dry, T.D. 3,418 ft., Viola 3,329 ft., Arbuckle 3,330 ft.

Rush County: Davis Childs 1 Honderick, NW SW 25-16-18w, dry, T.D. 3,599 ft.

Russell County: Duwe & Farris 1 Boxberger, NW NW 33-11-13w, dry, T.D. 3,306 ft., Kansas City 3,053 ft.

Bell Oil & Gas 1 Gross, SE SE NE 33-12-13w, dry, T.D. 3,560 ft., Viola 3,414 ft., Arbuckle 3,523 ft.

Isern Bros. 1 Whitt, NE NE NW 11-14-12w, dry, T.D. 3,306 ft., Kansas City 2,916 ft., Arbuckle 3,287 ft.

Sumner County: Barnsdall 1 Gilbert, SE SE NW 35-30-1e, dry, T.D. 4,156 ft., Kansas City 2,705 ft., Arbuckle 3,683 ft.

Two Cycling Projects in South Texas Considered

HOUSTON, Tex.—Two new cycling plants are planned for South Texas district, one to be built by Standard Oil Co. of Texas in the Alta Mesa area of Brooks County, and the other scheduled for construction in the McAllen area of Hildalgo County. Standard Oil Co. of Texas recently discovered deep gas-condensate production about 3½ miles southeast of Alta Mesa, which is about 20 miles southwest of Falfurrias. Gas-condensate production was opened in the Union Oil Co. of California 1 Justo Chavana dry hole, at 6,852 ft., which Standard deepened to 7,361 ft.

Coastal Refineries, Inc., of San Antonio, Tex., is reported working on plans for a cycling plant in the McAllen gas-condensate area of Hidalgo County.

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Wildcat Completions and Discoveries

DISCOVERY wells made a poor showing last week with only two oil wells, two condensate and three gas wells finished. The slow-up in completions is more of an indication of the discoveries that have been made over the past several months, rather than the tempo of exploratory drilling.

In Evangeline Parish, Louisiana Gulf Coast, the second condensate well was finished in the new Reddell pool. This well, located 1¼ miles east of Continental and Humble's discovery, found the Tate sand production at approximately the same time but was delayed in going on down to test the Wilcox. Tate sand was at 9,881 ft. and the Wilcox at 10,494 ft. Potential is 358 bbl. of 58-gravity condensate a day through ¼-in. choke.

Other wildcats finished included a 95-bbl. oil well in Archer County, North Texas; a condensate well and a small gasser in Colorado County, Texas Gulf Coast; a shallow gas well in Greer County, Oklahoma and a Dakota gas well in the South Baxter Basin, Sweetwater County Wyoming. The Wyoming well was a Tensleep test drilled to 7,172 ft. but plugged back to complete in the Dakota at 2,850 ft. for 5,000,000 cu. ft. a day.

WILDCAT COMPLETIONS

	Week ended December 4, 1943					Cumulative total for 1943				
	Oil	Distillate	Gas	Dry	Total	Oil	Distillate	Gas	Dry	Total
Ohio	0	0	0	2	2	4	0	23	54	81
Indiana	0	0	0	0	0	4	0	0	52	56
Kentucky	0	0	0	0	0	20	0	2	108	131
Illinois	1	0	0	12	13	75	0	3	381	459
Michigan	0	0	0	6	6	11	0	2	163	176
Kansas	0	0	0	9	9	55	0	1	347	403
Nebraska-Missouri-Iowa	0	0	0	0	0	0	0	0	24	24
Oklahoma	0	0	1	0	1	42	1	18	241	302
Texas:										
North Central	1	0	0	9	10	54	0	1	339	394
West	0	0	0	3	3	14	0	1	79	94
Panhandle	0	0	0	0	0	0	0	0	6	6
East	0	0	0	2	2	5	1	2	96	104
Gulf Coast	0	1	1	3	5	6	8	7	128	149
Southwest	0	0	0	5	5	21	11	4	256	292
Total	1	1	1	22	25	100	20	15	904	1,039
Louisiana:										
North	0	0	0	0	0	6	0	4	65	75
Gulf Coast	0	1	0	1	2	14	9	1	30	54
Total	0	1	0	1	2	20	9	5	95	129
Arkansas	0	0	0	0	0	2	0	0	60	62
Mississippi and Southeast	0	0	0	1	1	6	0	0	66	71
Montana	0	0	0	1	1	6	0	4	25	35
Wyoming	0	0	1	0	1	6	0	1	15	22
Colorado, Utah	0	0	0	0	0	0	0	1	6	7
New Mexico	0	0	0	1	1	6	0	2	26	34
California	0	0	0	2	2	7	0	9	133	149
Total United States	2	2	3	57	64	364	30	86	2,700	3,180
Total previous week	13	1	1	67	82					

LA.-ARK.

New Pool and Second Pay Are Week's Developments

SHREVEPORT, La. — Phillips Petroleum Co. and Kerlyn Oil Co. are reported to have opened a new pool in Union County, about 2 miles east of the Rainbow City pool. The wildcat, 1 Frost in 9-17s-13w, found saturation in sand at 2,768-2,816 ft. and pumped 275 bbl. of 16-gravity oil a day through perforations at 2,770-74 ft.

Columbia County.—A second producing zone, the Cotton Valley sand, was added to the Magnolia field. Hollyfield and McFarlane purchased the 1 Rowe Fee in 16-17s-20w from A. G. Oliphant, which was drilled to Reynolds lime about two years ago and which has produced considerable water with the oil. Production tests have not been finished but when plugged back to the Cotton Valley, near 6,000 ft., it was estimated to be good for 100 bbl. a day. Present production of the field is in the lime at an average of 7,400 ft. Offset Cotton Valley tests were said to be getting underway.

Bay-Tex Corp. Is Purchased By Progress Petroleum

CORPUS CHRISTI, Tex.—Bay-Tex Corp., organized by Sam E. Wilson, Jr., Corpus Christi oil man, in 1940, has been sold to Progress Petroleum, Inc., Houston. The sale, involving a consideration of more than $1,500,000, includes the Union Central Life Insurance lease, with 15 wells in the Stratton field and 15 in the Aransas Pass field. Mr. Wilson said the transaction did not involve any other of his holdings here.

CRUDE-OIL PRICES

Representative selected crude prices from all sections of the country appear below:

East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas*	1.06

*No change since 5-21-41.

Gravity Schedules

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Texas*
18-18.9	$0.80	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

Importance of 100-Octane Program Disclosed by Administrator

WASHINGTON, D. C.—The curtain of secrecy which previously obscured all details of how refiners met the first shock of multiplied demands for aviation gasoline when this country was pulled into the war 2 years ago was pulled slightly aside this week.

New plants designed specifically for production of 100-octane gasoline components are just now contributing a reasonably high percentage of total requirements, Petroleum Administrator Ickes disclosed.

"How serious a shortage we faced is indicated by the fact that at the end of 1942, a year after Pearl Harbor, new plants were contributing only 14 per cent of daily production of 100-octane," Ickes said.

"Thirty-nine per cent of production then," he continued, "was the result of conversions and improvising or what we called 'quick 100-octane program.' This had accounted for 62 per cent of the increase in production. About 16 per cent of production gains were attributable to an increase in the amount of tetraethyl lead added to the product.

"Quick" Program Results

"By July 1 of this year the 'quick' program was producing 44 per cent of total production and new-plant volumes had increased to only 22 per cent of production. Fifty-nine per cent of the total increase had been achieved through the 'quick' program.

"By the fall of 1943 this situation had begun to change as new facilities in the 1942-43 plant-construction program were completed. When this program is completed early in 1944 production from new plants will greatly overshadow the production of the 'quick' program, though the latter will continue in full force. Some minor expansions were still being made in this program late in 1943."

The "quick" program consisted of five steps, Ickes explained. These were adoption of a new blending agent called cumene which could be made by existing plants after slight alterations, conversion of catalytic-cracking plants to manufacture of aviation-base stock instead of motor gasoline, use of existing plants for production of a blending agent known as hydrocodimer, interplant movements of components of 100-octane, and technological improvements.

Cumene is a rich-mixture additive for aviation base gasoline, produced by the conversion of benzol, also a blending agent. Plants in operation, after minor adaptations, were making, as early as September 1942, more than 6,000 bbl. a day. Cumene, from the 18 plants currently operating, has skyrocketed the output of aviation fuel.

Fourteen plants in the country at the beginning of 1942 were producing automotive gasoline by the catalytic process. Minor alterations were quickly completed which resulted in the production of aviation base stocks in large volume.

Every refining facility was closely examined to the end that 100-octane supply be supplemented. Existing plants which produced polymer, a blending agent for automotive gasoline, were converted to the manufacture of codimer, which, when hydrogenated, becomes hydrocodimer, a powerful blending agent. Codimer is now being produced in large quantities in 72 plants, from which it is shipped to two other plants to be hydrogenated.

"The nation's extremity was a fighting challenge to our refining capacity," Ickes said. "The oil industry proved its ability to meet a crisis by completing incredibly quickly more than 200 projects, minor and major, for the conversion and adaptation of existing refining facilities to bridge the gap in plane-fuel output until new plants could be constructed and swing into production."

Postwar Gasoline To Be 80-Octane Number

(Continued from page 27)

which can be operated efficiently and economically will be put to the job of making motor fuel. Operating conditions will be changed in these units to make the fuel needed for car engines rather than for aviation, he stated. Plants shut down or converted to motor-fuel production under conditions more economical than aviation-fuel production will include a large percentage of wartime capacity. "As much as 100,000 bbl. a day of wartime aviation-gasoline production will probably fall in this category," Brown and Barnard state.

Of the several components of aviation gasoline, all are expensive both in monetary cost and in crude consumed, Brown and Barnard state. Eight of these nine major components are alkylate, hydrocodimer, isooctane, isopentane, neohexane, catalytically cracked naphtha, selected straightrun naphtha, and hydroformates. Hydroforming is also carried out in a type of catalytic cracking-hydrogenating-reforming process.

Postwar Aviation Fuel

Making certain assumptions, including that of a five-fold increase in postwar aviation-gasoline demand over the total of 9,000 bbl. a day in 1941, Brown and Barnard arrive at the estimate of a maximum of 50,000 bbl. daily for aviation fuel exclusive of military needs, on which they made no estimate.

"Such estimates as can be made at this time," Brown said, "indicate a maximum of early postwar demand for all aviation fuels of about 100,000 bbl. daily of which somewhat more than half will be of the high-octane-number type." The military part of this fuel supply "in all probability will be better than the present 100-octane-number grade."

The remaining refining capacity not required for aviation fuel will be used, if at all, under operating conditions which will make motor-fuel components with due regard for peacetime economics. The older, non-selective polymerization units will stop making codimer and will return to making high-octane-number blending polymer for improving motor fuels as was done before the war. Isomerization and alkylation will compete on a basis of economics instead of "octane at any price" as has been the case for war purposes.

Completion of Aviation-Fuel Plants Declared Essential

WASHINGTON, D. C.—Completion of the Government's aviation-gasoline plant program is essential to prosecution of the war, according to Frank Knox, secretary of the Navy, and Henry L. Stimson, secretary of war. The two cabinet members expressed their views in letters to Harold L. Ickes, petroleum administrator.

Secretary Stimson said that "provision of an adequate supply of 100-octane gasoline for use of the air force is among the most serious problems confronting the War Department."

Secretary Knox said that "continued and accelerated operation of naval aircraft can be realized only if the vital aviation fuel is forthcoming from the plants being constructed."

Of the 72 major 100-octane plants in the 1942-43 construction program, 32 have been completed and 40 will be finished during the next 4 months and 22 additional plants are scheduled for 1944, according to Administrator Ickes.

HIGHER CUTTING EFFICIENCY from SEISMOGRAPH BITS

1 Always include at least one Borium insert at the lower, outside corner of each cutting wing to prevent "diamond pointing." (Sketch)

2. On bits larger than 6 inches O.D a second Borium insert on the lower cutting edge improves drilling efficiency. (Sketch)

3. Cover leading faces of all bit wings with Tube Borium, using screen size of at least 10-20 mesh rather than finer meshes such as 30-40. Tests conclusively prove the larger Borium particles greatly increase drilling speeds.

4. Don't skimp on quantity. Tests show that bit life and efficiency is in direct proportion to the amount of Tube Borium applied (up to 1/8" in thickness).

More Seismograph Bits Are Hard-Faced With Tube Borium Than Any Other Alloy

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Stop wear . . . Eliminate Repair

Among the Drilling Contractors

Gorman Drilling Co., San Antonio, Tex., is rigging up at Sun Oil Co. 1 Mrs. E. B. Tuttle, outpost in the Blanconia area of Bee County, Texas, the test being 467 ft. from south and east lines of 500-acre lease in J. M. Keating Survey, about 1 mile north of production. Proposed depth is 5,350 ft. to test the field pay levels.

George P. Livermore, Inc., Lubbock, Tex., has finished a 6,511-ft. dry hole for Brown & Wheeler at their 1 French, 660 ft. from south and west lines Labor 22, League 75, Haskell County School Land, northwest Hockley County, Texas. The well had a small show of oil in the San Andres lime, but was carried to the Clear Fork which was dry.

H. R. Smith, Alice, Tex., is the contractor on Hewit & Dougherty 1 Celestia Dodson, 467 ft. from south and west lines of 402.5-acre lease in Share 8, Bluntzer subdivision, in the Bluntzer area, about 7 miles east of Orange Grove in Nueces County, Texas.

M. B. K. Drilling Co., Tulsa, and Odessa, Tex., are rigging up on Globe Oil & Refining 1 Clayton & Johnson, NW NW Section 41, Block 32-4n, T.&L. Railway Survey, southwest Borden County, Texas. It is a deep wildcat.

R. H. Gracey, Houston, Tex., has the contract to drill Union Oil Co. of California 2-C Louisiana Furs, Inc., in the Freshwater Bayou area of Vermilion Parish, Louisiana. It will be carried to 12,000 ft. and is in Section 31-11s-2e.

J. I. Roberts Drilling Co. of Shreveport, La., has been awarded the contract to drill C. H. Murphy, Jr.'s wildcat in Madison Parish, Louisiana. This is the 1 E. Sondheimer Co., 1,744 ft. north and 2,044 ft. east of southwest corner of 10-17n-12e. Roberts will carry the test to the Tuscaloosa horizon from which the Holly Ridge field in Tensas Parish is producing.

Penrod Drilling Co., Dallas, Tex., will continue drilling for Hassie Hunt, trustee, also of Dallas, in the Pine Prairie area of Evangeline Parish, Louisiana. Hunt's latest deep Wilcox test, on which Penrod has the con-

Crew of Jennings Drilling Co., Wichita Falls, Tex., at work in the Hildreth pool, Montague County, Texas. Left to right: L. H. Ward, toolpusher; J. S. Davis, floorman; B. E. Montgomery, derrickman; F. L. Overcash, floorman, and in the front, R. V. Gum driller

tract, is the 10 Crowell-Spencer Lumber Co., in 23-3s-1w, northwest flank of the dome. It is to go to 10,000 ft.

Dixie Drilling Co. has been awarded contract for Atlantic Refining Co. 9 St. Mary Parish Land Co., in the Bayou Sale field of St. Mary Parish, South Louisiana. This test, contracted to 12,500 ft. is 960 ft. south and 330 ft. east of northwest corner of NE¼ 3-17s-9w.

Mouser Drilling Co., Wichita, Kans., has moved in materials for Cities Service et al 1 Janne, W½ SW NW 24-15-12w, Russell County, Kansas. Stanolind Oil & Gas Co., also supporting the test, owns the NE Section 23 and the NW Section 24. Location is 1½ miles south and east of production.

Harbar Drilling Co., Wichita, Kans., has staked location for Nadel & Gussman 1 Blomgren, NE SE SE 24-16-2w, Saline County, Kansas. It is to be a Mississippi lime test and is 1 mile west of the Hunter pool. Nate Appleman and Winkler-Koch Engineering Co., owners of offset locations, are contributing.

Slusser Drilling Co., Marion, Kans., was reported moving in materials for a wildcat test for Transwestern Oil Co., about 9 miles southeast of Abilene. The well will be drilled with cable tools and all zones will be tested. Block was assembled by Don H. MacIvor of Wichita, Kans.

Portable Drilling Co., Tulsa, has contract for a wildcat in Noble County, Oklahoma. The well, Aladdin Oil Co. 1 Bezdecik in NE NE NW 13-20n-1w, is being supported with dry-hole money by Cities Service, Barnsdall, Sohio and Champlin Refining Co. Contract depth is 5,400 ft. or to the second Wilcox.

Loffland Brothers, Tulsa, have contract to drill a new deep test for California Co. in the North Lake St. John area of Tensas Parish, Louisiana, 660 ft. south and 675 ft. east of southwest corner of NW¼ 46-9n-10e. Scheduled depth is 10,000 ft.

Genuine Contractor Labor Demand Must Be Established

DALLAS, Tex. — It is absolutely necessary, the American Association of Oilwell Drilling Contractors declared last week, that the drilling industry establish a genuine worker demand with the central recruiting office before the War Manpower Commission will be justified in continuing its efforts toward obtaining additional skilled crewmen for carrying out the expanded drilling program projected by the Petroleum Administration for War. An acute shortage of skilled help does exist in every area, an association statement said, but only through an actual declaration of such a shortage from the contractors will the WMC be able to throw its full recruitment facilities into motion.

The association said it would be unable to supply drilling contractors with skilled workmen unless actual worker needs are confirmed.

Improved Facilities Permit Higher West Texas Output

AUSTIN, Tex.—The transportation bottleneck in West Texas having been relieved by completion of the Midland loading rack by Atlantic Refining Co., production days in December were increased from 18 to 22 by Texas Railroad Commission last week in the North Cowden field, Ector County, and the Emma, Fuhrman, Mascho and Means fields in Andrews County. These fields have a total basic allowable for December of 24,922 bbl. a day, so the addition of four producing days will boost average daily allowables by more than 6,000 bbl.

Permission was granted East Texas Salt Water Disposal Corp. to operate three more injection wells, 1 J. H. Moyar, H. B. Dance Survey, Rusk County; 2 Blum, King Survey, Upshur County, and 1 B. H. Read, Hopkins Survey, Upshur County.

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Ships, tanks, and other direct war uses continue to take a large proportion of our capacity.

Despite these added uses of RECTORSEAL, your cooperation in furnishing us proper priority and end use information has enabled us to maintain adequate stocks, and to make immediate shipments on all oil industry requirements. Whether you need one-half pint or 100 gallons, you can count on our furnishing it promptly for the all important use of drilling and maintaining oil properties.

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INSIDE and OUT—A Masterpiece of Rugged Accuracy!

This Pump handles Butane, Propane and heavier fractions.

Cross Section of Plunger

HILLS-McCANNA Positive PROPORTIONING PUMPS WITH POSITIVE ACTING CHECK VALVES

For Feeding and Injecting Constituents Intermittently or Continuously in Refineries — Pilot Plants—Field Treatment — Laboratory.

To live up to their high purpose of feeding regular and accurately measured dosages of constituents used in oil-field and refining operations, these Hills-McCanna Proportioning Pumps are a rare combination of superb engineering and sound construction. Utilizing the famous single plunger principle, these pumps are able to provide long, positive precision service, with little attention and low maintenance. Let us work with you in applying these pumps to your needs.

Each pump is supplied with check valves which minimize air binding, friction drop and turbulence.

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PERSONALS

ROBERT G. ATKINSON

Heads Shamrock's Technical Study Department

ROBERT G. ATKINSON graduated from the University of Pittsburgh with a degree in chemical engineering in 1929. Following this, he worked for about 2 years as assistant metallurgist for Firestone Tire & Rubber Co. in its steel products plant at Akron, Ohio.

He commenced his study in the field of petroleum manufacture in 1931 when he entered the petroleum refining department of the University of Pittsburgh and was graduated with a Ph. D. degree in 1934. For some time after that he worked for Pure Oil Co. on chemical engineering and laboratory investigations, and later transferred to the Pittsburgh experimental station of the U. S. Bureau of Mines.

In 1938, he started to work for Shamrock Oil & Gas Corp. as chief chemist and was later superintendent of the company's refinery at Sunray, Tex., for 2 years.

He has had an active part in establishing and operating the plant equipment by which Shamrock manufactures cumene, isopentane, isobutane and other war products. He is now working in Shamrock's Amarillo office as technical advisor with direct charge of technical analysis of new manufacturing processes and special problems of plant operations.

He is married and has one child, a 3-year-old daughter. His hobbies include rifle shooting at which he is expert, golf at which he is not expert, and looking after his three horses.

Maj. Frank H. Sheffield, in civilian life an independent oil operator of Houston, Tex., was promoted recently from captain at Army Air Force Navigation School, Hondo, Tex., where he is senior tactical officer of one of the training groups.

C. W. Sanders has resigned as regional and research geologist for Shell Oil Co., Inc., to engage in consultant work in Houston, Tex. Sanders was with Shell 17 years, working in the Mid-Continent, Rocky Mountain, Southwest Texas, California, and Gulf Coast regions. He spent a year in Europe, with headquarters at The Hague, Holland.

G. W. CORBY

Dr. Grant W. Corby, of Beverly Hills, Calif., who was drilling experimental oil wells for the Philippine Government before he was interned by the Japanese, arrived in New York last week on the exchange ship Gripsholm and said he would go at once to Washington, D. C., and report to Manuel Quezon, Philippine president. Members of Corby's party in the Philippines whose present whereabouts he did not know included **Russell Forsythe,** Los Angeles, Calif., surveying engineer; **Clarence Nelson,** Los Angeles, geologist; **Orville Stanford,** Manhattan Beach, Calif.; **Roamy Stone,** Santa Maria, Calif., and **Tex Howell,** Long Beach, Calif., and **A. E. Ireland,** Santa Maria, drilling superintendent.

Harry P. McClintock, recent graduate of University of Pittsburgh, School of Petroleum Engineering, has joined the staff of Arkansas Oil and Gas Commission as geologist. He succeeds **C. V. Lisman, Jr.,** who took a position with the G. H. Vaughn interests in Dallas, Tex.

J. P. Dunlap, head stillman in the cracking department of the Houston, Tex., refinery of Shell Oil Co., Inc., has been made acting assistant superintendent, taking the place of **L. C. Burroughs** during the latter's illness. **A. S. Mitchell** has been moved up to head stillman and **W. W. Coale** has been advanced to assistant head stillman in the cracking department pending the return of Dunlap. Burroughs, stricken with poliomyelitis, is expected to recover.

W. V. Phillips, who has been chief engineer of Lewis Production Co. for the past 6 years, has resigned to accept a position as petroleum engineer of Great Lakes Carbon Co., which has recently become active in the producing division of the oil business. Phillips will be located at the New York City headquarters of the company.

Charles D. Welch, Coffeyville, Kans., has incorporated Rearch, Inc. to operate an oil and gas development business.

Frank Porter, independent operator of Oklahoma City, Okla., and a member of Fain-Porter Drilling Co., was elected president of the Kansas-Oklahoma division of Mid-Continent Oil and Gas Association, meeting in Tulsa last week. He succeeds the late Burdette Blue. **Lloyd G. Owen,** vice president of Carter Oil Co., Tulsa, was reelected first vice president. Regional vice presidents were chosen as follows: Western Kansas, **E. B. Shawver,** independent operator, Wichita; eastern Kansas, **Carl Weiner,** independent operator, Chanute; northern Oklahoma, **A. W. Ambrose,** Cities Service Oil Co., Bartlesville; southern Oklahoma, **Lloyd Noble,** Noble Drilling Co., Ardmore; western Oklahoma, **W. R. Wallace,** Magnolia Petroleum Co., Oklahoma City.

Robert B. Bassett, formerly in the engineering department of Stanolind Oil & Gas Co., Tulsa, is now a basic flight instructor at Curtis Field, Brady, Tex.

Maj. Harold H. Arnold, former division geologist for the Texas Co. in the producing department at Tulsa, won a field promotion in the Tunisian campaign and was awarded a Silver Star for gallantry in action.

Dr. Ezequiel Ordonez, distinguished Mexican geologist, last week became

the first honorary professor of Texas University, Austin. Doctor Ordonez, who lectured in Austin on Paracutin, the new volcano in Mexico, is one of nine Mexico City professors to whom honorary titles were extended last October by the university board of regents in recognition of their work last summer at the joint field school conducted by University of Texas and National University of Mexico.

Winston P. Henry, independent oil operator of Houston, Tex., has been appointed vice chairman of Harris County War Finance Committee. He will have charge of the special bond-selling drives.

Maurice A. Finney, who was assistant division superintendent for Pure Oil Co. at Fort Worth, Tex., has been promoted to Illinois division manager, with headquarters at Olney. He succeeds **W. M. Peck,** transferred to Michigan.

M. A. Wright, formerly southern division engineer for Carter Oil Co., in Shreveport, La., has been transferred to Tulsa as assistant to **J. R. McWilliams,** production manager.

RALPH E. DAMP

Ralph E. Damp, superintendent of the northern division for Carter Oil Co., has established headquarters at Billings, Mont., and will be in charge of all company activities in Montana, Wyoming, Colorado, and North and South Dakota. **O. A. Seager,** former division geologist, has been appointed assistant division superintendent under Damp. **Nelson Y. Ruth,** northern division land man, will be in charge of all exploration activities in the division and **Don Blackstone,** formerly district geologist, has been appointed division geologist. **H. R. Shannon,** formerly district superintendent in Illinois, is being transferred to the northern division as district superintendent in charge of Wyoming operations. **O. D. Harper,** formerly drilling superintendent at St. Elmo, Ill., succeeds Shannon as Illinois district superintendent with headquarters at Carmi. **T. K. Whittington,** formerly assistant to Harper, becomes drilling superintendent in the Illinois district.

Harvey D. Carter, director of the supply division of Petroleum Administration for War, has resigned on account of ill health.

Steve DeBord, Jr., engineer in the secondary-recovery survey conducted by Arkansas Oil and Gas Commission, has been released to East Texas Salt Water Disposal Corp. Taking his place is **Henry Callaway,** petroleum engineer, of Texas University. **Dr. A. A. L. Mathews,** of Texas A. & M. College, has been added to the research staff of the survey, which is directed by **Dr. George H. Fancher,** University of Texas.

C. J. Dexter, of Artesia, has been elected president of the New Mexico Oil and Gas Association. Other officers elected at the fifteenth annual meeting of the association are: **Van S. Welch,** Artesia, vice president; **Harry Leonard,** Roswell, treasurer, and **Hugh L. Sawyers,** Roswell, secretary.

Royal L. Meyer, for 10 years superintendent of utilities for Standard Oil Co. of Indiana, has joined the engineering firm of Vern E. Alden, Chicago.

J. Tom Watson, attorney general of Florida, and **Dr. Herman Gunter,** Florida state geologist, were in Austin, Tex., last week conferring with a group of Texas oil attorneys, following the discovery of oil production in Florida. The Texas men included **Ed Roy Simmons,** head of the oil and gas section of the Texas attorney general's department; **George Gibbons,** Dallas, secretary of Texas Mid-Continent Oil and Gas Association; **Wallace Hawkins,** Dallas, attorney for Magnolia Petroleum Co.; **John W. Timmins,** Dallas, attorney for Sun Oil Co.; **F. T. Baldwin,** Houston, the Texas Co.; **Charles I. Francis,** Houston, Pure Oil Co.; **Herman Pressler,** Houston, Humble Oil & Refining Co.; **R. E. Hardwicke,** Fort Worth, now connected with Petroleum Administration for War, and **Andrew Howsley,** Albany.

Kennedy R. Marble, formerly junior geophysicist for Carter Oil Co., is now with Tropical Oil Co., in El Centro, Colombia, serving as gravitymeter computer and relief operator.

GREER W. ORTON

Greer W. Orton, New York, has been promoted to manager of the Texas Co.'s purchasing department, succeeding **W. F. Moore** who became assistant to the vice president with supervision of administration in the foreign operations division. Formerly, Orton served as director of the Materials Division for the Petroleum Administration for War. **R. S. Hatch** becomes assistant manager of the purchasing department and **R. M. Morrison** becomes general purchasing agent.

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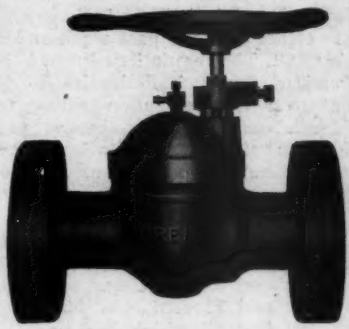

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Market Developments

East Coast

NEW YORK.—New regulations affecting surcharges for tank-wagon deliveries of less than 100 gal. of Nos. 2, 3 and 4 distillate fuel oil went into effect over the past week end in District 1. The regulations limited the premium for such deliveries to 0.5 cent over the per-gallon ceiling for 150-gal. quantities. Surcharges previously ranged from 0.5 to 1 cent per gallon. The new regulations also ban extra charges for deliveries of quantities between 100 and 150 gal.

Revocation of price increases amounting to 1.2 cents on gasoline, 1.5 cents on kerosene and distillate fuel oil and 30 cents per barrel on residual fuel oil which had been allowed in western Pennsylvania, New York and West Virginia was also announced by OPA. They had been granted to compensate for increased transportation costs. Since most sellers have not been charging the allowed increases, existing selling prices in the main will not be affected.

Gasoline was reported easier throughout District 1 as a result of the decline in consumption. During the past 6 weeks motor-fuel stocks in the district have risen about 20 per cent but they remain well below normal for this season.

The position of kerosene and heavy fuel oil continued to deteriorate. Kerosene stocks which had failed to improve materially in the early fall have begun to decline and the steady reduction in residual fuel-oil inventories continues.

Mid-Continent

DOMINANCE of war demand, along with paucity of crude supplies, intensified the shortage of gasoline for civilian use this week. Refiners reported they were sold up for December, and the open market appeared to be picked clean.

Kerosene was a close second in point of scarcity. Buyers from the East, where stocks were reported to be dropping to an uncomfortably low level, were able to uncover only a few scattered cars. The whole line of heating oils was increasingly tight.

More than 20 per cent of the oil industry's retail outlets in District 2 have been closed as a result of restrictions imposed by the war, figures released by B. L. Majewski, chairman of the district marketing committee of Petroleum Administration for War, reveal. On January 1, 1942, there were 81,659 of these outlets in the 15 states comprising the district. There were 64,674 on October 1, 1943, a loss of 16,985. Of this number 12,918 were closed in 1942. Oklahoma lost 932 of its 3,472 outlets, a decline of more than 26 per cent. Kansas gave up almost one-third of its outlets, 970 of its 2,894 being recorded as casualties.

There were 10,421 bulk stations in the district on October 1, 1943, compared with 11,102 at the beginning of 1942, a shrinkage of 681, or about 6 per cent. Heavy inroads were made in Kansas, where 16 per cent of the bulk stations vanished—889 of the original 1,065, a loss of 176.

Gulf Coast

HOUSTON, Tex. — Activity continued this week in the residual fuel-oil market with railroads and eastern industrial consumers displaying particular interest in augmenting supplies. The stock position of heavy fuel oils has improved materially in the past 6 weeks and few operators currently report more than comfortable working inventories.

Trading in motor fuels is following routine lines, chiefly dictated by wartime conditions. Regular customers are served as diligently as possible but numerous suppliers are compelled to prorate limited production on a basis of previous deliveries.

Completion of testing operations on the War Emergency Pipelines, Inc. 20-in. products line from Beaumont, Tex., to Norris City, Ill., is expected within a few days and at that time regular movement of heating oils will start north. Pending completion of construction of pumping stations and testing operations on the eastern extension, tentatively scheduled by January 1, products delivered at Norris City will be shipped by tank cars to the East Coast and diverted to working stocks at the half-way point. Much emphasis currently is placed on maximum production of kerosene at Gulf Coast plants. Stocks of kerosene on the East Coast are critical and PAW supply committees are urging refiners to maximize production of this product probably with a view to shipping large quantities through the 20-in. products line.

A.P.I. REFINERY REPORT

Week Ended November 27, 1943

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	140	2,507	308	1,138
Ind., Ill., Ky.	762	13,625	2,909	6,598
Okla., Kan., Mo.	335	6,889	1,154	2,465
Censored area*	2,147	31,497	18,463	23,289
Rockies	99	1,265	765	458
California	769	14,197	38,544	12,259
Total 11-27-43	4,281	69,980	62,143	46,187
Total 11-20-43	4,192	69,996	62,662	45,772
Total 11-28-42	3,740	74,628	73,674	50,195

*Reports combined on East Coast, Texas Gulf Coast, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines estimate)

Week ended:	Bbl. of crude*
November 27, 1943	239,761,000
November 20, 1943	239,869,000
November 29, 1942	234,850,000

*Excludes unrefinable California stocks.

Pacific Coast

LOS ANGELES, Calif. — Existing tight market for crude oil and probability of a gasoline shortage in 1944 have practically eliminated trading. There has been a consistent reduction in motor-fuel stocks. The directive reducing the octane rating of premium gasoline, replacing the earlier regulation limiting the manufactured volume to 10 per cent of total motor fuel, has restored the quality market.

Krieger Oil Co. has leased the facilities of El Tejon Oil & Refining Co. at Mountain View in the San Joaquin Valley and after renovating the 3,500-bbl. unit has started operations. Acquisition of this plant gives Krieger two refining units in California, one at Mountain View and the original plant at Clearwater which has a rated capacity of 3,000 bbl. daily.

California Oil Producers Agency has taken exception to a statement in a national magazine that gasoline consumption has only decreased 5.5 per cent since rationing and calls attention to the fact that since the war 219,000 out-of-state cars have registered in California and further that most of these carowners are in defense work and are qualified for B and C ration books. This reduction of 5.5 per cent was based on August sales and is in sharp contrast with a 16 per cent reduction in gasoline sales during September.

During the past 4 months gasoline stocks have been reduced about 5,300,000 bbl. and are now down to approximately 11,000,000 bbl. Part of this has been earmarked for military delivery and after the amount necessary for operations is deducted there is little left for civilian consumption. Deliveries to service stations are being made on a percentage basis of July-August sales.

Refinery Prices

(Prices as of December 7, 1943)

Quotations are f.o.b. plant in cars and in cents per gallon except where otherwise noted. They are exclusive of the federal excise taxes of 1.5 cents a gallon on gasoline and 4.5 cents a gallon on lubricating oils, and do not include marine lighterage charges.

REFINERY GASOLINE

Octane (A.S.T.M.):	80†	72-74	68-70	63-66
Mid-Continent*	‡6.00-6.25	5.750-6.000	.....	5.625
Gulf Coast	6.00-6.50	§5.750-6.250	§5.750-6.250	§5.250-5.750
Northeast Coast	9.80	9.2	9.2	.....
California	.....	6.25§-6.50§	5.750-6.125	5.125-5.500

*Basis Group 3. †1939 C.F.R. (research method). ‡Inland Texas and adjoining counties in Arkansas and North Louisiana. §Unleaded.

KEROSENE AND NO. 1 FUEL OIL

Gravity:	46	45	42-44	41-43	38-40
Mid-Continent*	.....	.....	4.500	4.125-4.375	.....
North Louisiana	.....	.....	.....	4.125-4.375	.....
Pennsylvania	6.250-6.625	6.125-6.250	.....	.....	.....
California	.....	.....	.....	4.500-5.500	4.250
Northeast Coast	.....	.....	.....	6.80	.....
Gulf Coast	.....	.....	.....	4.125	.....

*Basis Oklahoma Group 3.

TRACTOR, DIESEL, AND BUNKER FUEL OIL

Specifications:	46-48° G.	24 D.I.	48-52 D.I.	58 & above	Diesel bunkers	Residual Bunker C†
Mid-Continent*	4.125	.....	3.875-4.000	4.125-4.250	.....	$0.80-1.27
California	.....	2.750-4.000	.....	.....	‡1.35-1.45	1.10-1.15
Gulf Coast	.....	.....	4.000	4.125	1.45	0.85-1.27
Northeast Coast	.....	.....	.....	6.800	2.789	1.65-2.07
North Louisiana	.....	.....	.....	.....	.....	0.80-1.27

*Basis Oklahoma Group 3. †Gravity range ‡Pacific Specification 200

FURNACE OIL, GAS OIL, FUEL OIL

	No. 2	No. 3	No. 5	No. 6
Mid-Continent*	3.500-3.625	3.375-3.500	$0.85	$0.80
Pennsylvania (West)	5.875-6.125	5.875-6.000	†5.250-5.500	.....
Northeast Coast	6.7	6.7	1.95	1.65
California	5.5	5.5	‡1.10-1.25	‡1.10-1.15
Gulf Coast	3.750-3.875	....	1.35	0.85

*Basis Oklahoma Group 3. †36-40 gravity fuel. ‡Pacific Specification 300 §Pacific Specification 400.

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	4.750	5.700
North Texas	4.375	5.250
North Louisiana	4.375	5.250
California	4.875	5.500

LUBRICATING OILS

Bright and Steam Refined

OKLAHOMA (Group 3)—

200-210 D. 10-25	27.00
150-160 D, 0-10	23.00
120-125 D, 0-10	22.00
Steam refined:	
600 dark green (untreated)	9.00

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash)

10 pour point	30.50
15 pour point	29.50
25 pour point	28.00

Steam refined:

600	15.00	16.00
650	15.50	16.50
600 flash	16.00	17.00
650 flash	17.00	17.00

Neutral Oils

Vis. at 100° F. (except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

0-10 pour point:

200-S	15.00
300-S	18.00
400-S	19.50
600-S	20.00

Note: Viscous neutrals, 10-25 pour, quoted 0.5 cent under 0-10 oils.

CALIFORNIA—

200-2½-3	7.00	7.75
400-3-4	7.25	8.00
600-3-4	8.75	11.00

Neutral Oils

200-4-5	7.00	7.75
400-5-6	9.00	11.00
500-900, 5-6½	9.25	11.25

GULF COAST—

Pale oils:

200-3	8.50	8.75
300-3	9.00	9.25
500-3½	9.75	10.00
750-3½	10.00	10.25
2,000-4	10.50	10.75
3,000-4	12.25	12.50

PENNSYLVANIA—

150 vis. at 70° F., 3 color, 400-405 flash:

Zero pour point	37.50
10 pour point	36.50
15 pour point	35.50
25 pour point	30.00

200 vis. at 70° F., 3 color:

Zero pour point	39.50
10 pour point	38.50
15 pour point	37.50
25 pour point	32.00

WAX

(Cents per pound)

OKLAHOMA (Group 3)—

124-126 (A.m.p.) w.s. scale	4.250

PENNSYLVANIA (inland refineries)—

122-124 (A.m.p.) w.c. scale	4.250
124-126 (A.m.p.) w.c. scale	4.250

NEW YORK—

Wax in bags fully refined:

130-132 (A.m.p.) wax	5.850
133-135 (A.m.p.) wax	6.150

Crude scale:

124-126 (A.m.p.) w.s.	4.250
124-126 (A.m.p.) y.s.	4.250

TANK-WAGON PRICES IN 50 CITIES

(Gasoline prices based on regular grades, tax included, undivided dealer)

ATLANTIC AND NEW ENGLAND

(Socony-Vacuum Oil Co., Inc., and Atlantic Refining Co.)

	Dealer tank wagon	Com-bined tax	Kero tank wag.
Baltimore, Md.	15.95	5.50	10.50
Boston, Mass.	14.90	4.50	10.10
Burlington, Vt.	16.90	5.50	10.20
Buffalo, N. Y.	16.30	5.50	10.90
Dover, Del.	16.70	5.50	12.30
Hartford, Conn.	15.60	4.50	10.00
Manchester, N. H.	17.30	5.50	12.10
Newark, N. J.	15.30	4.50	10.00
New York, N. Y.	16.10	5.50	10.10
Philadelphia, Pa.	16.20	5.50	11.90
Pittsburgh, Pa.	16.70	5.50	12.20
Portland, Me.	16.30	5.50	10.20
Providence, R. I.	15.00	4.50	9.90
Washington, D. C.	15.20	4.50	11.30
Average 14 cities	16.02	5.14	10.85

(All prices undivided dealer basis.)

CENTRAL

(Standard Oil Co. of Indiana, Standard Oil Co. of Ohio, Continental Oil Co. and Texas Co.)

	Dealer tank wagon	Com-bined tax	Kero tank wag.
Chicago, Ill.	14.10	4.50	10.60
Cleveland	15.00	5.50	*9.00
Dallas, Tex.	13.00	5.50	7.00
Des Moines, Iowa	14.40	4.50	10.10
Detroit, Mich.	14.40	4.50	10.00
Fargo, N. D.	16.90	5.50	11.80
Huron, S. D.	16.30	5.50	11.00
Indianapolis, Ind.	15.60	5.50	10.10
Little Rock, Ark.	17.50	8.00	10.00
Milwaukee, Wis.	16.10	5.50	10.80
Minneapolis, Minn.	15.90	5.50	10.60
Omaha, Neb.	15.40	6.50	9.80
Tulsa, Okla.	16.50	7.00	8.50
Wichita, Kans.	13.30	4.50	8.70
Average 14 cities	17.46	5.57	9.84

*Includes 1-cent state tax.

SOUTHEASTERN

(Standard Oil Companies of New Jersey, Kentucky, and Louisiana)

	Dealer tank wagon	Com-bined tax	Kero tank wag.
Atlanta, Ga.	18.90	7.50	*11.50
Birmingham, Ala.	18.50	8.50	9.00
Charleston, S. C.	18.95	7.50	....
Charleston, W. Va.	19.25	6.50	13.30
Charlotte, N. C.	20.10	7.50	11.30
Jacksonville, Fla.	18.90	8.50	9.50
Jackson, Miss.	17.50	7.50	†9.00
Louisville, Ky.	16.50	6.50	8.50
Memphis, Tenn.	17.90	8.50	10.50
New Orleans, La.	17.75	8.50	10.00
Norfolk, Va.	17.45	6.50	12.30
Average 11 cities	18.34	7.50	10.50

*Includes 1-cent state tax.
†Includes ½-cent state tax.

MIDWESTERN

(Continental Oil Co.

	Dealer tank wagon	Com-bined tax	Kero tank wag.
Albuquerque, N. M.	17.50	7.50	10.00
Boise, Idaho	20.10	6.50	16.50
Casper, Wyo.	17.00	5.50	12.00
Denver, Colo.	14.50	5.50	11.00
Helena, Mont.	17.00	6.50	13.00
Phoenix, Ariz.	18.50	6.50	12.50
Reno, Nev.	17.50	5.50	13.30
Salt Lake, Utah	18.50	6.50	14.30
Average 8 cities	17.56	6.25	12.98

PACIFIC COAST

(Standard Oil Co. of California)

	Dealer tank wagon	Com-bined tax	Kero tank wag.
Portland, Ore.	17.00	6.80	13.80
San Francisco, Calif.	14.50	4.50	11.50
Seattle, Wash.	17.00	6.80	13.80
Average 3 cities	16.17	5.83	13.03
Average 50 cities	16.89	5.96	10.98

AMONG EQUIPMENT MEN

Bardsley Joins Perrault As Division Manager

Bo Bardsley, widely known in the pipe-line supply business, has joined Perrault Brothers, Tulsa, as partner and manager of their pipeline supply division. Mr. Bardsley is a long-time resident of Tulsa and has been actively engaged in the pipe-line supply business for the past 19 years. He has a host of friends through the oil-producing world and has always served in the supply-and-maintenance division of the pipe-line industry.

Elgin Softener Appoints Scarritt Sales Manager

E. W. Scarritt has been appointed sales manager of Elgin Softener Corp., Elgin, Ill.

Mr. Scarritt graduated from University of Illinois in 1925 in chemical engineering and chemistry. Following research work in water conditioning at the university, he has been identified in this field for 18 years. A recognized chemical engineering authority, he has advanced many notable contributions to the science of water treatment and purification. A vice president of Elgin Softener Corp., he has been associated with the company since 1927.

Connelly and Hanrahan Named PIW Executives

Appointment of the two top executives in Petroleum Iron Works division of United States Steel Products Co. was announced recently by John Hauerwaas, company president.

J. A. CONNELLY

W. I. HANRAHAN

The Petroleum Iron Works plants at Sharon, Pa., and Beaumont and Port Arthur, Tex., were acquired recently by United States Steel Corp.

J. A. Connelly is vice president and general manager of PIW division. William I. Hanrahan is vice president.

According to an announcement by Hauerwaas, the present PIW plants manufacture only steel barrels, drums and pails. This manufacturing operation, however, at Beaumont and Port Arthur, establishes the first steel fabrication for United States Steel Corp. in Texas.

Briggs Clarifier Reorganizes Its Sales Force Into Two Divisions

Briggs Clarifier Co., 1339 Wisconsin Avenue, Washington, D. C., has reorganized its sales force into two divi-

H. T. MOORE

E. K. BURGESS

sions, one for automotive distribution and the other for industrial distribution. Henry T. Moore has been appointed general sales manager and

J. H. NASH

J. M. WILLIS

E. K. Burgess and J. H. Nash have been appointed assistant sales managers for the automotive division and industrial division, respectively.

The company also announces the appointment of J. J. Stroud as engineering and sales representative for Kentucky. He will maintain headquarters at Paducah. J. M. Willis has recently been appointed Ohio state sales and engineering representative. He will headquarter at Springfield.

Crawford to Distribute Butler Products

Butler Manufacturing Co., Kansas City, Mo., has completed an arrangement with Crawford Tank & Supply Co., Kirby Building, Dallas, Tex., for the distribution of Butler bolted steel tanks, walkways, stairways, and other oil-field equipment.

Officers of Crawford Tank & Supply Co. are: H. D. Crawford, president; E. L. Byer, vice president, and S. P. Wallace, vice president. Other members of the organization are as follows:

L. Glenn Rader, district manager, C. L. Pirtle, salesman, and J. B. Graham, field superintendent, Houston, Tex.; A. J. de la Houssaye, salesman, New Orleans, La.; C. E. Henderson, salesman, Lake Charles, La.; H. W. Stokesberry, field superintendent, Houma, La.; W. B. Brawner, salesman, Corpus Christi, Tex.; J. E. Hobson, district manager, Odessa, Tex.; E. E. McDonald, and G. G. Byer, salesman, Fort Worth, Tex.

Classified Advertising

PATENT ATTORNEYS

PATENTS, Trade-Marks, Booklet, "General Information Concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 418, Bowen Bldg., Washington, D. C.

FINANCING

CAPITAL SEEKERS—Interested in raising $25,000 or more for a legitimate project should write to AMSTER LEONARD, Fox Theater Bldg., Detroit 1, Mich.

"Analysis of Current American Financing Through Stock Sales." Photostatic copy $5. A research paper listing 79 underwriters of $42,560,000 in recent months and 25 most active royalty dealers of 1943. JOHN MORRIS, Box 5411, Philadelphia, Pa.

TAX AND LEASE SERVICE

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1944 will be your heaviest tax year. Retain us now to see to it that you pay only your just share. We specialize in the handling of all state and local taxes affecting the Independent Operator, Royalty Owner, and Drilling Contractor, in the states of Texas, Louisiana, Arkansas and Mississippi. We will also purchase oil and gas leases and royalty for you, with all information held strictly confidential. Write, wire or call.

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WANTED: Distributors for Oklahoma and Mississippi to handle a general line of drilling muds. Drilling Mud Corp., 315 Thompson Bldg., Tulsa, Oklahoma.

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FOR SALE—MAPS

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